

50826/B/1

H. x x x. b
19

64

for Ranking
from the Author

A

PRACTICAL TREATISE

ON

ABDOMINAL HERNIA.

BY

THOMAS PRIDGIN TEALE, F.L.S.,

FELLOW OF THE ROYAL COLLEGE OF SURGEONS, AND SURGEON TO
THE LEEDS GENERAL INFIRMARY.

WITH NUMEROUS ILLUSTRATIONS.

LONDON:

LONGMAN, BROWN, GREEN, AND LONGMANS,
PATERNOSTER ROW.

1846.



LONDON:

Printed by S. & J. BENTLEY, WILSON, and FLEY,
Bangor House, Shoe Lane.

TO

SAMUEL SMITH AND WILLIAM HEY,

FELLOWS OF THE ROYAL COLLEGE OF SURGEONS, AND SURGEONS TO
THE LEEDS GENERAL INFIRMARY,

THE FOLLOWING PAGES ARE INSCRIBED,

IN TESTIMONY OF

PROFESSIONAL ADMIRATION AND SINCERE PERSONAL REGARD,

BY

THEIR FRIEND AND COLLEAGUE,

THE AUTHOR.

ADVERTISEMENT.

IN offering to the Medical Profession a new work on a subject upon which so much has been written by some of the most distinguished surgeons of Europe, and which may now be regarded as almost exhausted, the author feels it incumbent upon him to offer some explanation of the circumstances which have led to its appearance.

The late Sir Astley Cooper, a short time before his decease, undertook to prepare the article "Hernia," for a publication then in progress, but unfortunately for the interests of science, that event, so universally deplored, occurred before he had even entered upon the work. The author soon afterwards was requested to supply the article on this subject for the same work, and, although fully sensible how imperfect any effort of his must necessarily be in comparison with what might have emanated from the pen of this highly gifted individual, he nevertheless entered upon the task with the determination to use his best endeavours to exhibit a systematic view of the present state of the Science of Surgery in reference to the subject of Hernia.

On the completion of the manuscript circumstances occurred which caused the suspension of the work for which it was intended; and, some months ago, when more than two years had elapsed since the last part of that work appeared, the editor and publisher kindly released him from his engagement with them. In consequence of this, and with

a view to publication in an independent form, the whole subject has again been considered, additions have been made, new woodcuts obtained, and the work rendered as complete as the numerous calls of an active professional life permitted.

Nothing could be more remote from the author's intention than a desire to supersede the many valuable works on this subject which already enrich the literature of medicine. They must each be individually studied by all who aspire to a high position among surgeons; but, as the information they contain is generally on detached portions of the subject, it certainly has appeared to him that there is still a place in medical literature for a more systematic treatise, which would form a text-book for the student, whereby he might be able to appreciate the varied relations, conditions, and complications of any case of hernia presented to his observation in the wards of the hospital, and would prove a work of easy reference to the practitioner, during the trying moments, when he is called upon, perhaps rarely, and after long intervals, to operate for the relief of strangulated hernia.

LEEDS, January 1, 1846.

CONTENTS

	PAGE
INTRODUCTORY REMARKS	1
Hernia, definition of	<i>ib.</i>
—— classification of	<i>ib.</i>

PART FIRST.

ABDOMINAL HERNIA GENERALLY CONSIDERED.

CHAPTER I.

On the Walls of the Abdomen.

1. The Internal Abdominal Aponeurosis	2
2. Peritoneum	7
3. The Subcutaneous Filamentous Tissue	8
(Superficial fascia.)	

CHAPTER II.

On the Hernial Apertures

10

CHAPTER III.

On the Hernial Sac.

1. Mode of formation	12
2. Forms and Varieties	13
3. Structural Alterations of the Sac	15
4. Spontaneous closure of the neck of the Sac	17
5. Morbid Changes in the Sub-serous Filamentous Tissue	18

CHAPTER IV.

Constituents of Herniæ.

1. Hernia in which the Cæcum forms the principal part of the protrusion, with the causes, symptoms, and treatment	21
---	----

	PAGE
2. Hernia in which the Sigmoid flexure of the Colon, is the part protruded	
3. Ditto, in which the Urinary Bladder is the contained organ (CYSTOCELE)	25 26

CHAPTER V.

Statistics of Hernia.

1. The relative frequency of Hernia in the human race	31
2. Ditto, ditto, in the sexes	32
3. Ditto, ditto, on different sides of the body	34
4. Ditto, ditto, at different ages	ib.
5. Ditto, ditto, in the rich and poor	37
6. Opinions relative to the prevalence of Hernia, not founded on statistics	ib.
7. Mortality of Hernial subjects	38

CHAPTER VI.

Causes of Hernia.

1. Predisposing causes	40
2. Exciting	41

CHAPTER VII.

Effects of Hernia. 43

CHAPTER VIII.

Conditions of Hernia.

1. Reducible Hernia	45
General characters and symptoms	ib.
2. Irreducible Hernia	46
a. General characters and symptoms	ib.
b. Diagnosis of this condition of Hernia	48
c. Evils resulting from it	49
d. Inflamed irreducible Hernia	50
e. Obstructed ditto	51
3. Strangulated Hernia	53
a. Seats of stricture	56
b. Pathological effects of strangulation	59
c. Symptoms of ditto	62

CHAPTER IX.

Treatment of Reducible Hernia.

	PAGE
1. Palliative treatment	67
Trusses, their construction, Girdles, &c.	<i>ib.</i>
2. Curative treatment, or radical cure of Hernia	74
a. Means employed for effecting the closure, obliteration, or destruction of the sac	75
a. Excision of the Testicle	<i>ib.</i>
β. Incision of the Sac	76
γ. Excision, suture, and cauterization of the Sac	<i>ib.</i>
δ. Ligature of the Sac after incision of the integuments	77
ε. Acupuncturation	78
ζ. Insertion of Goldbeaters' skin in the Sac	79
b. Means calculated to promote the contraction or closure of the Hernial apertures	81
a. Trusses	<i>ib.</i>
β. Ligature of the Sac and its envelopes	82
γ. The cutaneous plug	83

CHAPTER X.

Treatment of Irreducible Hernia.

1. The conversion of the Irreducible into the Reducible condition	89
a. When Irreducible from hypertrophy	<i>ib.</i>
b. Ditto, from adhesions	91
2. The prevention of the increase of the Hernia	93
3. The relief of the symptoms resulting from the Hernia	<i>ib.</i>
4. Treatment of Irreducible Hernia, when inflamed	<i>ib.</i>
5. Ditto, ditto, when obstructed	94

CHAPTER XI.

Treatment of Strangulated Hernia.

1. The Taxis	95
a. Cautions necessary in using it	<i>ib.</i>
b. Mode of performing it	98
c. Adjuvants of the Taxis	102
a. Blood-letting	103
β. Hot bath	104
γ. Cold applications	<i>ib.</i>
δ. Tobacco	105
ε. Opium	106

	PAGE
ζ. Purgatives	107
η. Evacuation of gas from large intestine by means of a tube introduced into the rectum	<i>ib.</i>
2. Operation for Strangulated Hernia	109
a. Operation without opening the Sac	<i>ib.</i>
b. Ditto, involving its opening	122
α. Preliminary arrangements	<i>ib.</i>
β. Incision of the envelopes	<i>ib.</i>
γ. Incision of the stricture	124
(Instruments employed 125 et seq. :)	
δ. Examination and treatment of the protruded intestine	128
1. Treatment of the intestine when hyperhematic	129
2. Ditto, ditto, when gangrenous	130
3. Ditto, ditto, when perforated	133
4. Ditto, ditto, when it exhibits an indentation from the stricture	135
5. Ditto, ditto, when adherent	<i>ib.</i>
ε. Examination and treatment of protruded omentum	138
Mode of its removal	139
ζ. Accidents of the operation	142
1. Wounds of intestine	<i>ib.</i>
2. Ditto, of blood-vessels	143
η. Treatment subsequent to the operation	145

CHAPTER XII.

Reduction in Mass.

1. General remarks on this accident	148
2. Symptoms	150
3. Treatment	153
Table of recorded cases	155 et seq.

CHAPTER XIII.

Intestinal Fistula consequent upon gangrenous or wounded Hernia.

Spontaneous cure of Intestinal Fistula	162
Anatomical characters of ditto	173
Effects of ditto	176
Complications of ditto	177
α. Prolapse at superior aperture	<i>ib.</i>
β. Ditto, of lower Orifice of Intestine	179
γ. Ditto, of both Orifices	180
δ. Effects of prolapse	181

	PAGE
ε. Causes of prolapse	181
ζ. Changes of organization in the prolapsed part	<i>ib.</i>
Accidents liable to occur after recovery	182
Treatment of Intestinal Fistula	183

PART SECOND.

ABDOMINAL HERNIA CONSIDERED IN REFERENCE TO ITS
SPECIES AND VARIETIES.

CHAPTER I.

Inguinal Hernia.

1. Anatomy of the region of Inguinal Hernia	206
a. The Subcutaneous Filamentous tissue	<i>ib.</i>
b. Aponeurosis of the External Oblique Muscle	208
c. The external Ring	209
d. The lower portion of the Internal Oblique Muscle	210
e. The lower portion of Transversalis Muscle	212
f. The Inguinal Canal	214
g. The Internal Aponeurosis	215
h. The Spermatic Sheath	<i>ib.</i>
i. The Peritoneum	217
k. The Subserous Filamentous tissue	218
l. The Epigastric Artery	219
m. The Spermatic Cord	220
a. The Vas Deferens	<i>ib.</i>
β. The Arteries of the Cord	<i>ib.</i>
γ. The Spermatic Vein	221
δ. ————— Nerves	<i>ib.</i>
ε. The Vaginal process of Peritoneum	222
ζ. The Filamentous tissue of the Cord	<i>ib.</i>
η. The Spermatic Sheath	<i>ib.</i>
θ. The Cremaster Muscle	<i>ib.</i>
2. The descent of the Testicle	224
3. Peculiarities in the Female	230
4. Statistics and causes of Inguinal Hernia	<i>ib.</i>
a. Age	<i>ib.</i>
b. Tall Stature	231

CHAPTER II.

Variety I. Oblique Inguinal Hernia.

	PAGE
General description	235
1. Changes in the relative position of the rings, and in the envelopes in cases of old Scrotal Hernia	239
2. Separation of the elements of the Spermatic Cord by old Herniæ .	242
3. Comparative frequency of Oblique Inguinal Hernia in Women	244
4. Complications of this variety	246
5. Diagnosis of ditto	247
a. Means of distinguishing it from direct Inguinal Hernia .	248
b. Ditto, from Femoral ditto	249
c. Ditto, from Hydrocele of the Spermatic Cord	ib.
d. Hydrocele of the Tunica Vaginalis	252
e. Varicocele	255
f. Chronic Abscess descending through the Inguinal Canal .	256
g. Adipose Tumour	ib.
h. Inflamed Lymphatic Gland	ib.
i. Testicle retained within the Inguinal Canal	ib.
k. Hematocele of the Tunica Vaginalis	257

CHAPTER III.

Treatment of Oblique Inguinal Hernia.

1. Reducible Oblique Inguinal Hernia	258
Palliative treatment. Trusses	ib.
2. Treatment of Oblique Inguinal Hernia, when Irreducible	272
3. Ditto, ditto, when Strangulated	273
a. Operation without opening the Sac, the Hernia being Inter- stitial	ib.
b. Ditto, involving the opening of the Sac, the Hernia Inter- stitial	ib.
c. Ditto, without opening the Sac, the Hernia Scrotal	274
d. Ditto, involving the opening of the Sac, the Hernia being Scrotal	275

CHAPTER IV.

Hernia of the Tunica Vaginalis.

1. General Remarks on this variety of Hernia	277
2. Hernia of Tunica Vaginalis, the descent of the Testicle being com- plete	ib.
3. Ditto, the Testicle in the Inguinal Canal	280

CONTENTS.

xiii

	PAGE
4. Ditto, the Testicle being within the Abdomen	281
5. Ditto, the Tunic being closed at the lower part of the Cord, but open above	<i>ib.</i>
6. Ditto, in Females	285
7. Treatment of Hernia of the Tunica Vaginalis	286

CHAPTER V.

Direct Inguinal Hernia.

1. Situation at which the Protrusion occurs in this variety	298
2. Anatomical peculiarities of direct Inguinal Hernia	290
3. The investments of ditto	292
4. Symptoms and physical characters	293
5. Treatment	294

CHAPTER VI.

Femoral Hernia.

Definition	297
1. Anatomy of the region of Femoral Hernia	<i>ib.</i>
2. Developement and Anatomical characters of ditto	306
3. Complications of ditto	314
4. Conditions of ditto	315
5. Symptoms and external characters	318
6. Statistics and causes of Femoral Hernia	323
7. The Treatment	326
a. Of Reducible Femoral Hernia	<i>ib.</i>
b. Of Irreducible ditto	330
c. Of Strangulated ditto Taxis	331
a. Operation, preliminary considerations	332
β. Operation without opening the Sac	<i>ib.</i>
γ. Ditto, involving the opening of the Sac	335

CHAPTER VII.

Umbilical Hernia.

Definition of this species of Hernia	338
1. Developement and Anatomical characters	339
a. In the Fœtus	<i>ib.</i>
b. Infants	340
c. Adults	<i>ib.</i>
2. Conditions of Umbilical Hernia	343
3. Statistics and causes	<i>ib.</i>

	PAGE
4. Treatment	344
a. In Reducible state,—Radical cure	<i>ib.</i>
Pallative Treatment	346
b. In Irreducible state	349
c. In Strangulated condition,—Taxis	350
Operation	<i>ib.</i>

CHAPTER VIII.

<i>Ventral Hernia</i>	352
---------------------------------	-----

CHAPTER IX.

<i>Obturator Hernia</i>	357
-----------------------------------	-----

CHAPTER X.

<i>Ischiatic Hernia</i>	361
-----------------------------------	-----

CHAPTER XI.

<i>Perineal Hernia</i>	363
----------------------------------	-----

CHAPTER XII.

<i>Vaginal Hernia</i>	366
---------------------------------	-----

CHAPTER XIII.

<i>Pudendal Hernia</i>	369
----------------------------------	-----

CHAPTER XIV.

<i>Diaphragmatic Hernia</i>	372
---------------------------------------	-----

LIST OF ILLUSTRATIONS.

	PAGE
1. Cylindroidal Sac	13
2. Spheroidal Sac	<i>ib.</i>
3. Pyriform Sac	14
4. Conoidal Sac	<i>ib.</i>
5. Pouched Sac	15
6. Sac with plurality of necks	<i>ib.</i>
7. Sac with an appendix reflected on itself	16
8. M. Bonnet's plan of obliterating the Sac by Acupuncturation	78
9. M. Gerdy's operation for obliterating the Hernial aperture by the cutaneous plug	85
10. Hernia Knife, recommended by the late Sir Astley Cooper	125
11. Sheathed Bistoury, constructed by Mr. Weiss, after the suggestion of Mr. B. B. Cooper	126
12. The concealed Bistoury, used by Mr. Turner	<i>ib.</i>
13. The same, with the blade raised	<i>ib.</i>
14. Hernia director, described by Mr. Lawrence	127
15. Ditto, employed by Mr. Key	<i>ib.</i>
16. Winged ditto, devised by Mr. Turner	128
16b. Inguinal Hernia reduced in mass	158
17. Membranous funnel formed by the Hernial Sac	165
18. Intestinal Fistula with double prolapse	180
19. Dupuytren's Enterotome	190
20. Segmental ditto, as seen in different aspects—from Bourgery	196
21. Lower portion of Aponeurosis of external Oblique Muscle	208
22. Lower portion of internal Oblique Muscle	211
23. The Lower portion of the Transversalis Muscle	212
24. The anterior portion of the internal Aponeurosis (fascia transversalis), with the Spermatic and Femoral Sheaths	216
25. The internal Ring seen from within, the internal Aponeurosis having been removed	219
26. The Cremaster Muscle	223
27. Oblique Inguinal Hernia, after Scarpa	238
28. Epigastric Artery displaced towards the Pubes by an Oblique Inguinal Hernia	241

	PAGE
29. Elements of Spermatic Cord separated by an Oblique Inguinal Hernia	243
30. Inguinal Hernia in which the Cæcum is the protruded part	246
31. Single common Truss for Inguinal Hernia	258
32. Ditto, applied	259
33. Spring Truss with triangular Pad	260
34. M. Malgaigne's Truss with mushroom Pad	262
35. Form of Spring for single Inguinal Truss	263
36. Diagram illustrating the principal upon which the above form of Spring operates	264
37. Double common Truss for Oblique Inguinal Hernia	266
38. Ditto, applied	267
39. Form of Spring for double Truss	<i>ib.</i>
40. Chase's Truss for Oblique Inguinal Hernia	268
41. Chase's double Truss for ditto	270
42. Salmon's single Truss	<i>ib.</i>
43. Front view as applied	<i>ib.</i>
44. Back view ditto	271
45. Hernia of Tunica Vaginalis. Guy's Hospital	278
46. Oblique Inguinal Hernia behind a Hydrocele. St. Thomas's Hospital	282
47. Encysted Hernia of Tunica Vaginalis in Museum of Guy's Hospital	284
48. Direct Inguinal Hernia, seen from within. Leeds Infirmary	291
49. Dr. Chase's Truss for direct Inguinal Hernia	295
50. Femoral Aponeurosis. Female	300
51. Femoral Sheath and its contents	302
52. Obturator Artery arising from the external Iliac, &c.	309
53. Ditto, arising from the Epigastric	311
54. Single Femoral Truss	326
55. Ditto, applied	327
56. Ring of Metal for the Hollow Pad	330
57. Eagland's Umbilical Girdle	347
58. Ditto, applied	<i>ib.</i>
59. Chase's Umbilical Truss	348
60. Eagland's Truss for Vaginal Hernia and for prolapse of the womb	368

A PRACTICAL TREATISE

ON

ABDOMINAL HERNIA.

HERNIA (from ἑρνος, a branch) is a displacement, partial or complete, of any viscus from its proper cavity, not occurring through penetrating wounds, nor through the natural outlets of the body.

Hernia, thus defined, is the designation of an extensive genus of diseases, which includes several sub-genera, species, and varieties. The cavity furnishing the displaced organ determines the sub-genus; the aperture through which the viscus escapes, the species; and some minor peculiarities constitute the varieties.

The following table exhibits the different sub-genera, species, and varieties.

GENUS.	SUB-GENERA.	SPECIES.	VARIETIES.
HERNIA.	CRANIAL.		
	THORACIC.		
	ABDOMINAL.	Inguinal.	{ Oblique Inguinal Hernia. Hernia of the Tunica Vaginalis. Direct Inguinal Hernia.
		Femoral.	
		Umbilical.	
		Ventral.	
		Obturator.	
		Ischiadic.	
		Perineal.	
		Pudendal.	
		Vaginal.	
		Diaphragmatic.	

PART I.

ABDOMINAL HERNIA GENERALLY CONSIDERED.

CHAPTER I.

ON THE WALLS OF THE ABDOMEN.

THE viscera of the abdomen and pelvis are surrounded by a complex apparatus of bone, muscle, and aponeurosis, which is lined internally by serous membrane, and is externally invested by the subcutaneous tissue and skin. These structures conjointly form the walls of the abdomen and pelvis, support and protect the contained viscera, and contribute to the various movements of the trunk.

1. *The internal abdominal aponeurosis.*—Under this designation I shall describe the delicate fibrous layer which, to a considerable extent, lines the internal surface of the muscular and osseous structures of the walls. This membrane was first observed by Sir Astley Cooper, who described that portion of it which lines the transversalis muscle under the name of *fascia transversalis*. The portion of the same membrane which is spread over the iliac fossa has by several writers been named *fascia iliaca*, and that which is prolonged into the pelvis *fascia pelvica*. Much embarrassment has been felt by the student from these portions of the same fibrous membrane being described separately as distinct structures. I shall endeavour to obviate this inconvenience in the present treatise by considering them as parts of one continuous

membrane, forming an extensive but incomplete aponeurotic lining of the abdominal and pelvic cavity. The principal subdivisions of this membrane will be described as its *anterior, posterior, and pelvic portions*; and those tubular, or funnel-shaped, processes of the same membrane which invest the blood-vessels in their transit to and from the abdomen and pelvis, will be designated respectively *spermatic sheath, femoral sheath, obturator sheath, &c.*

[The term aponeurosis is here adopted in the hope of avoiding the vagueness with which that of fascia is too frequently employed. The perspicuity of anatomical writings in general would be greatly promoted if the term fascia were limited exclusively to membranous expansions of areolar or filamentous tissue, and aponeurosis to similar expansions of white fibrous tissue. Objections may be urged with reason against the latter word, since its derivation (*ἀπὸ* and *νεῦρον*) would express a very different meaning from that which has long been arbitrarily given to it. It being, however, commonly used to express a tendinous expansion, or a membrane composed of the white fibrous tissue,* the better plan would be to express that particular form of membrane by the word *aponeurosis*, and membranous expansions of areolar or filamentous tissue by the term *fascia*, as in the case of the *spermatic* and the *superficial fascia*. At the same time, and upon the authority of De Borgen, Dr. Craigie, and most recent writers, the expression *filamentous tissue* will be substituted for that of *cellular*; the

* The author is aware that a difference of opinion prevails among general anatomists as to the anatomical and chemical composition as well as the physical properties of the *transversalis fascia*. For while some regard it as being composed *partly* of white, but *principally* of the yellow fibrous tissue, and to partake more or less of the physical properties belonging to both those anatomical elements; others, on the other hand, (and among them the author,) are equally positive of its being made up *entirely* of the former, and therefore comparatively inelastic, and also inextensible, unless indeed from the application of a long-continued and slowly acting force.

latter term tending to mislead students as to its anatomical characters. The confusion occasioned by the application of the term fascia has been alluded to by Dr. Todd, in his article, Abdomen, in the "Cyclopedia of Anatomy and Physiology;" and he quotes, as an instance, the singular confusion existing in Velpeau's description of the *subcutaneous filamentous tissue*, or, according to his nomenclature, *superficial fascia*. As justly remarked by Dr. Todd, "he observes, in one place, that the deep layer of the subcutaneous cellular tissue constitutes the superficial fascia; and, in the next page, states that the superficial fascia is nothing else than the cellular tissue condensed, whose laminæ, strongly applied one against the other, are ultimately reduced to somewhat of the aponeurotic form." There is no doubt that by most authors what is called superficial fascia is nothing more than the subcutaneous filamentous tissue, and that the two terms are synonymous.] *The internal abdominal aponeurosis* varies in strength in different situations. *a.* Its *anterior portion*, (*fascia transversalis* of other authors,) which lines the transversalis muscle, is strong inferiorly, becoming attenuated as it ascends, until it reaches the diaphragm, where it is gradually lost in the connecting filamentous tissue. In like manner, as it approaches the rectus muscle it becomes thinner, and at the posterior surface of the sheath of this muscle its fibres generally cease to be recognizable; but an apparent continuity of the aponeurosis is produced by the union and subsequent prolongation of the two layers of filamentous tissue, which served to connect it by one of its surfaces to the transversalis muscle, and, by the other, to the peritoneum. In this filamentous prolongation of the membrane, a few aponeurotic fibres may sometimes be observed extending as far as the median line. Inferiorly, the anterior portion descends behind the symphysis of the pubes, where it joins the pelvic portion. Behind Gimber-

nat's ligament, to which it is closely adherent, it is interwoven with the tendinous fibres of the transversalis muscle, and, in conjunction with these fibres, is attached to the pubes, where it is continuous with the posterior portion. Where the large vessels of the lower extremity pass behind Poupart's ligament, the anterior and posterior portions are separated for a space corresponding in extent with the sheath of these vessels. On the iliac side of the sheath they are again continuous, and their line of union extends along the iliac half of Poupart's ligament and the crest of the ilium. At the place where the spermatic vessels traverse the abdominal muscles, the anterior portion sends off a tubular investment which accompanies these vessels in their passage to the testicle. *b. The posterior portion, (fascia iliaca,)* spread over the iliac fossa, covers the iliacus and psoas muscles, passing behind the iliac vessels, and, at the same time, sending before these vessels a few investing fibres. At the ileo-pectineal line it is continuous with the pelvic portion. As this portion of the aponeurosis is placed behind the large vessels in the iliac region, so it maintains the same relative situation in its descent into the thigh, where it constitutes the posterior part of the femoral sheath, whilst a similar prolongation from the anterior portion, which descends in front of the femoral vessels, forms the anterior part of the sheath; or, in other words, the lower part of the internal abdominal aponeurosis is prolonged as a funnel-shaped process, which invests the femoral vessels in their passage behind Poupart's ligament and along the upper part of the thigh. Posteriorly, it covers the psoas and quadratus lumborum muscles and the lumbar vertebræ, adheres to the ligamentum arcuatum, and is lost superiorly in the filamentous tissue which lines the diaphragm. *c. The pelvic portion,* continuous with the anterior behind the pubes, adheres to the triangular ligament, and descends to the point where the urethra quits the pelvis. It then

turns backward upon the upper surface of the prostate and neck of the bladder, and constitutes the anterior ligament of the bladder. Laterally, it is connected with the iliac portion at the ileo-pectineal line, from which it passes over the posterior surface of the internal obturator muscle, giving off a tubular investment for the obturator vessels, and descending until it reaches the oblique line which extends from the symphysis of the pubes to the spine of the ischium. From this line it extends over the pelvic surface of the levator ani muscle, and reaches the side of the rectum, bladder, and prostate, becoming blended with these parts, and forming, in this situation, the lateral ligaments of the bladder and the fibrous capsule of the prostate. In the interval between the spine of the ischium and the promontory of the sacrum, the pelvic portion is placed behind the internal iliac artery, and gives a tubular investment, more or less distinct, to its different branches, as they escape from the pelvis. On reaching the surface of the sacrum, the pelvic portions of each side become continuous.

The external surface of this aponeurosis is generally connected to the various structures upon which it rests, by means of a layer of filamentous tissue; but in those parts where it comes in contact with the osseous and ligamentous structures, namely, at the crest of the ilium, ileo-pectineal line, tendon of the transversalis muscle, Poupart's ligament, the ligamentum arcuatum, &c., the union is of a more intimate nature, its fibres being continuous with the periosteum in the case of the former tissue, and the aponeurotic fibres in that of the latter. Its internal surface is connected with the peritoneum by the subserous filamentous tissue of the abdomen and pelvis. In structure it exhibits the ordinary characters and physical properties of white fibrous tissue,* being constituted of minute wavy fibres, having a whitish, glistening aspect, and possessing so low a degree of elasticity and

* See note, p. 3.

extensibility as to be termed inelastic, and under ordinary circumstances inextensible. From a long-continued and slowly acting force, as in the pressure of hernial protrusion, we find that the fibres of which the internal abdominal aponeurosis is composed, as well as those of the tendons of the external and internal oblique, and the transversalis, admit of being somewhat elongated. These fibres present considerable variety in their course and arrangement. In some parts they are nearly parallel; in others, irregularly interwoven; and in some situations they admit of being separated into two or more distinct layers.

Most authors describe this membrane as fibro-cellular, or as partly fibrous and partly cellular. It would, however, be more correct to regard it as simply aponeurotic, varying in strength and thickness in different anatomical regions, and in extent in different subjects. Strictly speaking, the membrane should be said to terminate where its characteristic aponeurotic fibres cease; and its apparent prolongation as an elastic membrane should be regarded as a mere coalescence of the two layers of filamentous tissue, which served to connect the aponeurosis to the peritoneum on one side, and to the abdominal muscles on the other.

2. *Peritoneum*.—The serous membrane of the abdomen and pelvis, after lining the walls of this cavity, is reflected over the viscera, and gives to them a more or less perfect covering. Its internal surface is smooth and shining, and lubricated by an unctuous serosity. The external surface of the peritoneum is not easily defined, since it does not obviously differ from a dense filamentous tissue, which gradually assumes a looser texture, until it merges in the common subserous tissue.

The strength and thickness of the peritoneum vary in different situations and subjects. It is comparatively thick and stronger in the loins and lower part of the abdomen, than in the neighbourhood of the umbilicus. It is said by M. Cloquet

to be in fat persons as thin and transparent as the arachnoid from the deposition of fat between the laminæ of the subserous tissue, or in other words in the filamentous tissue, immediately subjacent to the basement membrane, so as to produce a partial decomposition of the membrane from without inwards, whilst in dropsical subjects it frequently appears thickened from condensation of the filamentous tissue. The elasticity of the peritoneum, as of all serous membranes, is enormous; as is evinced in the great increase in extent which it undergoes in ascites and pregnancy, and the rapid reduction to its normal extent after the removal of these causes of distension. This elasticity is said to be owing to the admission of the yellow fibrous element into the layer which forms the chief substance of the subserous membrane; the white element, which was previously wavy, becoming straight on the application of the distending force, and resuming the wavy direction on its removal.

The peritoneum facilitates the movements of the viscera upon each other, and against the abdominal walls; and, by its folds and involutions, suspends them in their places and determines the extent of their movements. It may also add slightly to the strength of the walls of the abdomen.*

3. *The Subcutaneous Filamentous tissue, (Superficial Fascia,)* spread over the lower part of the abdomen and upper portion of the thigh, assumes in all, save very fat subjects, a membranous character. Its external surface is coarse and reticulated, contains more or less adipose tissue, and is attached to the skin. Its internal surface is more membranous, almost free from fat, and is generally united by loose and delicate filaments to the abdominal muscles and their tendons, and to the aponeurosis of the thigh. At the linea alba, Poupart's ligament, the external ring, and the saphenous opening, the deeper layer

* The abdominal muscles, as entering into the formation of the walls of the abdomen, will be described (so far as hernia is concerned) in the anatomy of the parts connected with the various kinds of hernia.

is more firmly attached, in consequence of an intermixture of aponeurotic fibres derived from the subjacent structures.

The subcutaneous tissue lodges the superficial blood-vessels, lymphatics, and nerves. The whole of the subcutaneous tissue of the inguinal and femoral regions is, by some authors, named *superficial fascia*; whilst the latter designation is, by others, limited to the deeper seated and more membranous layer.

CHAPTER II.

ON THE HERNIAL APERTURES.

PROPERLY speaking, there are no apertures in the abdominal or pelvic walls in their normal condition, since the various passages by which the vessels and nerves leave and enter the abdominal and pelvic cavities are completely filled by them. The same objection has been made by some anatomists against the use of the term abdominal cavity, on pretty nearly the same or even less grounds. But, notwithstanding these objections, it has been found desirable, for the convenience of description, to retain these terms. Those parts of the abdominal and pelvic walls, through which the viscera protrude, may then be termed the hernial apertures. They are of two kinds, natural, and abnormal: the former exist for the transmission of blood-vessels and other structures, and surround the vessels and their sheaths; the latter result from defective development, or laceration of aponeurosis or muscle. Prior to the existence of hernia, as above remarked, the normal apertures scarcely merit this designation, since they present no absolute solution of continuity, being occupied by the structures which they transmit, and by filamentous tissue. Hence, when hernia does not exist, the term is only used to designate certain parts of the walls which are weaker than the rest, and offer a more feeble resistance to the pressure of the viscera, and which, from their situations, are more exposed to that pressure. The structures forming the boundaries of the hernial apertures are white fibrous tissue, bone, and muscle. The former is the most frequent,

and sometimes the sole constituent, as in the umbilical aperture. The external abdominal ring is formed by white fibrous tissue and bone; the internal ring, by the muscular and tendinous fibres of the lower part of the transversalis muscle. It is important to bear in mind these structural peculiarities in estimating the changes to which the apertures are subject, as well as the influence they may exert upon a protruded viscus.

When distended by hernia, the apertures have a tendency to become enlarged, and to assume a circular form. The osseous structures undergo no change; but the softer tissues, by laceration or temporary extension, yield to violent force suddenly applied, or by simple extension from more moderate but long-continued pressure. Thus, muscular fibre admits of gradual, and, to a certain degree, of sudden elongation. It is also subject to spasmodic action, and consequently may exert constricting influence; as, for example, at the internal abdominal ring.* White fibrous tissue, as before observed, powerfully resists sudden distension, but gradually yields to a moderate but long-continued force. Hence, an aperture formed of this tissue alone, or in conjunction with bone, can only admit of sudden enlargement from separation of its fibres, or from their actual laceration; but it may become greatly enlarged by elongation of the tissue, from the long-continued distending force of old herniæ. After being in this manner elongated, it may however to a certain extent become less so, after the lapse of a period more or less considerable, on the cessation of the distending cause. This property has an important reference to the radical cure of hernia.

* By the internal abdominal ring is here meant those structures which surround the abdominal extremity or the commencement of the sheath of the spermatic vessels.

CHAPTER III.

ON THE HERNIAL SAC.

WHEN the viscera escape from their natural boundaries through the hernial apertures, they usually push a portion of the peritoneum before them; and thus, in their hernial state, or new situation, derive from it an investment named the *hernial sac*.

1. *Mode of formation*.—In the neighbourhood of the apertures, the peritoneum is loosely attached, and readily “lends itself,” as M. Cloquet has well observed,¹ for the formation of the sac, gliding before the viscus over the edge of the aperture. The sac is thus formed, in its early stage, by a displacement of that portion of the peritoneum lining and surrounding the aperture; but, at a subsequent period, the causes of protrusion continuing, the protruded membrane itself becomes stretched and the sac thereby enlarged, not only by further protrusion of the peritoneum, but also by actual stretching of the texture of that portion already displaced; and should the pressure of the viscus from behind be considerable, or suddenly applied, it yields even more freely, in consequence of minute lacerations of its external surface.² The sac thus produced may be regarded as a mere pouch of the peritoneum. The opening from the general peritoneal cavity into this sac is called the *mouth*; the contracted portion immediately beyond, the *neck*; the dilated portion beyond this, the *body*; which usually terminates in a rounded form, the *fundus* or *base*.

When the peritoneum quits the abdomen, so as to form a hernial sac, it is accompanied by its subjacent filamentous

tissue, which is stretched and elongated. If the displacement be great or sudden, many of the filaments are torn, and the sac soon forms new connections to the surrounding parts by a tissue of the same character. But a hernial sac is not *always* formed by a distending or propelling force from within, as above described; for traction from without is also capable, under certain circumstances, of producing it. Thus an enlarged testicle, a hydrocele, or a tumour developed externally to the peritoneum, may, by its weight, draw down the little corrugated portion of peritoneum lining the internal opening to the inguinal canal, and cause the depression of the membrane, which naturally exists in this situation, to enter the canal, and thus to constitute a pouch ready to receive the viscera.³

2. *Forms and varieties.*—The sac presents an almost endless diversity of forms. These forms are referred by M. Cloquet to four primitive types:—*a.* the cylindroidal (figure 1); *b.* the spheroidal (fig. 2); *c.* the pyriform

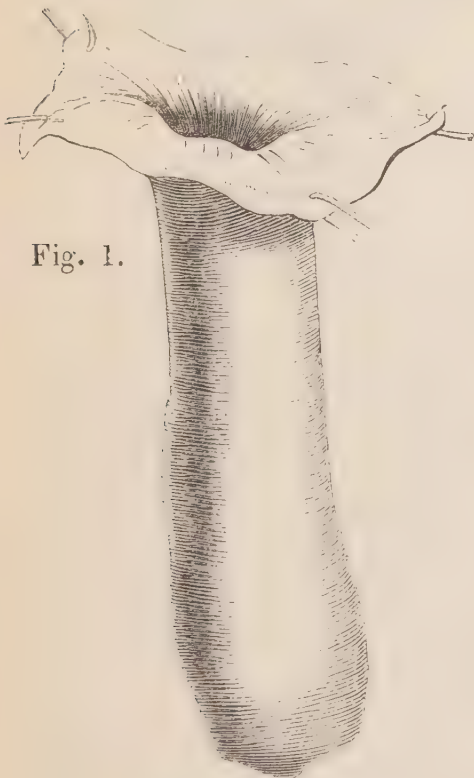


Fig. 1.

Cylindroidal sac.

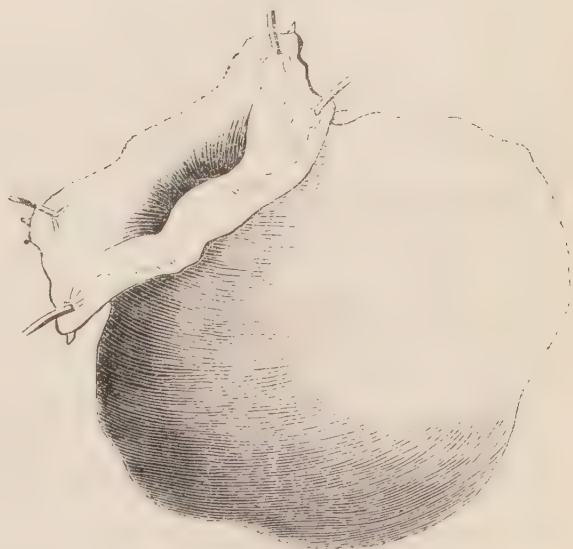


Fig. 2.

Spheroidal sac.

(fig. 3); and *d.* the conoidal (fig. 4). By different combinations of these, various secondary forms are produced. From unequal pressure of its contents, or unequal strength of

Fig. 3.



Pyriform sac.

its different or of surrounding parts, the sac may yield unequally and assume an irregularly pouched condition (fig. 5). These partial dilatations sometimes constitute small supplementary sacs, which occasionally communicate with the primary sac by a well-defined neck. Occasionally the sac exhibits two or more succes-

Fig. 4.



Conoidal sac.

sive compartments, separated from each other by a contracted portion or neck (fig. 6); and a few instances have been observed in which there existed at the lower and posterior part of the sac an aperture, surrounded by a fibrous neck, communicating with a serous bag which passed upwards behind the sac, and adhered to the anterior surface of the cord (fig. 7). This variety of sac M. Cloquet has designated "*Sac à appendice renversé.*" Two or more sacs sometimes open into the abdomen by a common mouth; and a plurality of sacs communicating with the abdomen by

distinct mouths have been known to exist at the same hernial aperture. M. Cloquet is of opinion that these sacs

Fig. 5.



Pouted sac.

Fig. 6.



Sac with plurality of necks.

result from separate hernial protrusions, and in this opinion my observation leads me to agree with him. In many herniæ of the bladder and of the cæcum, the sac is only partial, and in some protrusions of these organs it is altogether deficient. Those herniæ through the diaphragm are also devoid of sac, which result from defective muscular development, accompanied by a deficiency of the serous membranes; in which cases a communication exists between the peritoneal and pleural membranes.

3. *Structural alterations of the sac.*—In recent herniæ, and also in many of older date, the sac does not sensibly differ in structure from the healthy peritoneum; and it frequently preserves the natural appearances of a serous

Fig. 7.*



Sac with an appendix reflected
upon itself.

membrane, even when the subserous tissue is materially altered.

Scarpa pointed out that many alterations of structure, supposed by previous anatomists to be seated in the sac, belonged in reality to the subserous tissue. Whilst, however, we acknowledge the force of the observations of Scarpa, we must avoid falling into the opposite error of imputing to the subserous tissue various morbid changes essentially connected with the serous part of the sac; changes which frequently exert a most important

influence in the production of strangulation. True it is that great difficulty frequently exists in determining to which of these tissues the changes belong, since to the naked eye there is no definite line of boundary between them, and it is impossible to determine, even by a close inspection, where the one ends and the other begins; there being a gradual transition from the surrounding dense filamentous tissue, to the more loosely reticulated texture of what is usually called the *subserous* tissue.

The most important alteration which occurs in the walls of the sac, is a gradual conversion of the filamentous or areolar tissue into the white fibrous element. This fibrous structure becomes developed most frequently at the neck of the sac. I have examined this change of structure in a very early stage, when the fibres were scarcely perceptible to the naked

* These illustrations of the different forms of the hernial sac are taken from Cloquet.

eye; but, by rendering the membrane tense, the resistance which they produced was rendered sensible to the touch. So closely was this fibrous structure incorporated with the internal membrane or wall of the sac itself, that it was scarcely possible to separate them, without perforating the sac. In the more advanced stages of this development of fibrous tissue, the adventitious structure appears in distinct fasciculi, which are firm, white, opaque, and glistening, irregularly interwoven. I have in my possession the sac of an old direct inguinal hernia, around the neck of which are numerous opaque white glistening fasciculi, precisely similar in their physical characters to those of which the dura mater is composed.

So closely is this altered structure connected with the serous membrane, that M. Cloquet, in describing it, says that the serous membrane appears thickened, whitish, opaque, and firm, and more or less distinctly fibrous.⁵ The fibrous change also frequently occurs around the orifices of supplementary pouches developed from the sac. Occasionally, but less frequently, the body of the sac exhibits a similar change.

The sac is sometimes opaque. It is occasionally the seat of red and brown coloured spots from ecchymosis, and it sometimes exhibits various degrees and forms of vascular injection.

The secreting surface of the sac, when inflamed, pours out lymph, which, as before remarked, becoming organized, forms false membranes and adhesions between it and its contents, and may thus render the hernia irreducible. Fibrous bands may in this way be developed, and may occasion stricture of any portion of the contents of the hernial sac.

The sac occasionally secretes an undue quantity of serum, which accumulates and constitutes what has been termed dropsy of the sac. Enormous quantities of serum are sometimes found in the sac.

4. *Spontaneous closure of the neck of the sac.*—When the

entrance of the viscera into the sac is prevented, its neck has a remarkable tendency to contract, and, as it diminishes in size, it becomes more loosely attached to the hernial aperture. This contraction may proceed to such a degree as to produce actual closure of the mouth of the sac. A serous bag then remains closed like the tunica vaginalis from the general cavity of the peritoneum. By the side of this closed cyst, a fresh portion of peritoneum may afterwards be protruded through the same hernial aperture, so as to form a new sac in close contiguity with the old one. In this manner, M. Cloquet considers that many of the serous cysts occurring in the vicinity of hernial tumours are produced. Probably the cases of femoral hernia imbedded in a double sac, recorded by Mr. Chevalier,⁶ and M. Dupuytren⁷ have been formed in this way.

An essential requisite for the contraction of the neck of the sac is the absence within it of any part of the viscera, which is most effectually fulfilled by the use of well-adapted trusses.

In some cases, before the perfect closure of the mouth of the sac is accomplished, a fresh visceral descent carries before it a new pouch of peritoneum; and thus a new sac is formed, which communicates at its base with the contracted opening of the neck of the original sac. This process is sometimes even repeated, and thus are produced, as Arnaud has suggested, and M. Cloquet has proved, those forms of sacs which have two, three, or more compartments placed one above another, and communicating by narrow necks or openings.

5. *Morbid changes in the subserous filamentous tissue.*—This structure is more frequently the seat of pathological change than the sac itself. From interstitial deposition of organizable lymph, it becomes a dense, opaque, resisting membrane, sometimes separable into several layers, which may be divided in succession in the operation for strangulated hernia before the sac is reached. When thus altered, the sac itself, more especially its body, is frequently unchanged, and retains its natural tenuity and transparency.

The subserous tissue of the sac of some herniæ, more especially femoral and direct inguinal, is the seat of deposits of fat, which, when abundant and indurated, bear a close resemblance to omentum, and have frequently been mistaken for it during operation. This error may be avoided by observing that the fatty substance in question is not immediately surrounded with any structure resembling serous membrane, but is closely connected on all sides to the surrounding parts by filamentous tissue. By carefully separating these packets of fat, which in most instances are irregularly distributed, intervening portions of the sac itself may generally be exposed.

CHAPTER IV.

CONSTITUENTS OF HERNIÆ.

THERE are none of the abdominal or pelvic viscera, except the pancreas and duodenum, which have not occasionally contributed to the formation of hernial tumours.

The parts most frequently protruded are the ileum and the omentum.

The stomach has, in a few instances, been found in the hernial sac, but it is less frequently protruded than was formerly imagined. Herniæ occurring at the upper part of the linea alba near the ensiform cartilage, attended with distressing dyspeptic symptoms, were supposed by Garengéot⁸ and the younger Pipelet⁹ to be herniæ of the stomach; but in none of the cases which they have recorded was the stomach ascertained by dissection to have been protruded. They merely inferred that the hernia was constituted by the stomach from the situation of the tumour, the severe symptoms of gastric disturbance by which it was attended, and the relief of these symptoms experienced from the use of trusses. We are not justified in inferring from these circumstances that the stomach is the part protruded. The connexion existing between the stomach and the colon and omentum sufficiently explains the disturbance of the functions of the former, when the latter organs are displaced. Although the cases recorded by Garengéot and Pipelet cannot be adduced in proof of the stomach having been the displaced organ, yet numerous instances have occurred in which diaphragmatic herniæ have been constituted either entirely, or in part, by the stomach;

and a few rare instances have occurred of enormous inguinal herniæ, in which, along with other viscera, the stomach was partially protruded.¹⁰

The rectum, along with other portions of the intestinal tube, constituted a large ischiadic hernia in a case communicated to Haller.¹¹

The protruded portion of the alimentary canal may consist of a part only of its cylinder, or of an entire coil, or of several feet of the tube. Sometimes a small portion of the cylinder has been lengthened into a pouch or diverticulum,¹² which becoming strangulated has proved fatal.

Many instances are recorded of the ovaries, fallopian tubes, and uterus having been in a hernial state. Mr. Nourse removed the ovaries which formed a hernial tumour in each groin of a young woman admitted into St. Bartholomew's Hospital. The tumours had become so painful as to incapacitate her from pursuing her usual avocations, on which account she desired their removal. After the operation she enjoyed good health, but ceased to menstruate. Dr. Davis witnessed the gravid uterus at the ninth month protruding at the navel, and hanging forward over the pubes.

Where there has been great congenital deficiency of the abdominal muscles, the spleen, the liver, and the kidneys have contributed to the formation of hernial tumours.

Herniæ have received various names from the viscera which constituted the protrusion; as enterocele (έντερον an intestine, and κήλη a tumour), epiplocele (ἐπίπλοον the omentum, and κήλη), entero-epiplocele, metrocele (μήτηρ uterus), cystocele, (κυστις the bladder), &c.

Some of the viscera, as the cæcum, sigmoid flexure of the colon, and urinary bladder, when protruded, give to the hernia such peculiar characters as to require a special notice in this place.

1. *Hernia in which the cæcum forms the principal part of the protrusion.*—The cæcum in its natural locality is invested

with peritoneum only in front and laterally, and is fixed in its position posteriorly by filamentous tissue. Under a variety of circumstances, it gradually proceeds from the iliac fossa, and taking the course of the inguinal canal sometimes reaches the lower part of the scrotum. Throughout its whole descent, it constantly retains the filamentous connexions of its posterior surface, adhering successively to the inguinal canal, and to the structures within the scrotum. In this respect, the descent of the cæcum is analogous to that of the testicle; which organ, being covered by peritoneum only laterally and in front, is held in its situation posteriorly by filamentous tissue, and retains this mode of connexion throughout its whole descent.

After the cæcum has descended as low as the internal ring, its posterior surface is the part usually first protruded into the inguinal canal. Hence, when the protrusion is of small size, it is constituted by a portion of the cæcum altogether devoid of peritoneum, and a true hernia without a sac is produced. As it enlarges, the peritoneum is occasionally stripped to some extent from the muscular coat of the cæcum, and thus a cecal hernia of larger size may exist without a sac. In this form and stage of the complaint, from the yielding character of their filamentous connexions, the protruded part may by pressure be made to enter the abdomen, but it speedily returns when the pressure is discontinued.

If the cæcum descend still lower, and sometimes even in the earliest stage of the protrusion, a portion of it invested by peritoneum, as well as the uncovered posterior surface, is protruded. The hernia now presents the peculiar character of having a partial sac; a small pouch of peritoneum being drawn down, which is situated at the upper part of the protrusion. This small partial sac is limited to the upper part of the hernia, the inferior lateral and posterior parts of the protruded cæcum being devoid of peritoneum and fixed by filamentous adhesions to its new locality.

As the cæcum descends, the neighbouring portions of the ileum and colon are drawn down, and also a larger peritoneal pouch, which may allow portions of the floating viscera to descend into it. This new protrusion, by progressively enlarging the sac, may cause it ultimately to descend lower than the cæcum itself. If in this advanced stage of cecal hernia the sac be opened, the floating viscera are seen within it; after the removal of which the appendix vermiformis comes into view, and the posterior wall of the sac appears pushed forward by the cæcum situated behind it.

The cæcum is not always the part which primarily constitutes the hernia. Sometimes the lower portion of the ileum is the part first protruded; and this descent of the small intestine increasing may drag down the cæcum with it.

It might naturally be expected that the cæcum should become hernial on the right side of the body only. But this is not necessarily the case. Sandifort has represented a hernia of the left side formed by the cæcum.¹³

When the cæcum is protruded, it usually forms an oblique inguinal hernia. It, however, occasionally constitutes hernia of the tunica vaginalis; for the cæcum has been drawn down into the scrotum along with the testicle, in consequence of adhesions contracted during the foetal state.

Amongst the causes which tend to produce a descent of the cæcum may be named an habitual accumulation of fæces in this organ, which, aided by straining efforts, and perhaps by gravitation, may determine the descent of the cæcum in preference to the floating viscera.

Great local weakness of the lower part of the abdominal walls probably predisposes to this affection, since, in most cases where the cæcum forms one of the constituents of herniæ of large size, the inguinal regions are remarkably feeble. To the above causes may be added an habitual flatulent

condition of the large intestines, and occasionally perhaps of the small, which, by the consequent pressure upon the abdominal walls in front, tends to thin them and stretch the individual layers of which they are composed. From the peculiar form and anatomical connexions of the cæcum, gas, when once accumulated within it, escapes with difficulty; the inflated cæcum constantly presses, therefore, upon or near to the inguinal ring, and, upon any unusual exertion of the abdominal muscles, or the assumption of any peculiar position of the body favourable to the production of hernia, a portion of the cæcum is protruded through the ring. I have already stated, that, in their early stages, herniæ into which portions of the cæcum enter are reducible; but where they have attained considerable size, and are of long standing, they are necessarily irreducible. The floating viscera, which may have descended into the sac, may indeed admit of replacement; but the cæcum remains fixed to the inguinal canal or scrotum. But there can be no doubt that the irreducible condition in these herniæ, when they are of moderate size, may be gradually overcome by prolonged recumbency, aided by the pressure of a truss with a hollow pad. By this treatment the cæcum may be made to assume a retrograde course, and, in some instances, it may be replaced within the abdomen.

The symptoms peculiar to hernia in which the cæcum is the principal part displaced, in the early stages are extremely obscure. Indeed, I am not aware that it can by any means be recognized. When, however, it is of large size, an uneven nodulated surface sometimes indicates the character of the protrusion. Scarpa has observed, in large herniæ of this description, a depression in the iliac fossa, produced by the absence of this portion of the large intestines from its usual situation. The gradual descent of the hernia may also lead to the suspicion of the protrusion being cecal; but it must be remembered that many oblique

and direct inguinal herniæ, formed by the *small* intestine, are gradual in their descent. We may, also, be misled by our patients, who may have overlooked, and only have become aware of the existence of the disease, when a fresh descent of the floating viscera into the originally small peritoneal sac had caused a sudden enlargement of the hernia; from which period they date the commencement of their complaint.

As we can seldom be quite certain, before operating, whether the cæcum or the floating viscera constitute the hernia, we should bear in mind, even in small herniæ, the possibility of the cæcum being protruded, and also the anatomical peculiarities of this form of hernia; but still more should we remember the possibility of this being the case when the herniæ of the right side are unusually large. Petit and Arnaud were greatly embarrassed from being ignorant of the characters of this kind of hernia. And instances are on record of the cæcum having been opened, from the surgeon expecting to find a sac, and from not recognizing the muscular coat of that intestine. This coat, however, in many of these old herniæ, is so altered in appearance by interstitial organized deposits as not readily to be detected. In large herniæ the stricture is seldom dangerous, and in those in which the cæcum is the protruded gut, it is rarely, if ever, formed by the sac. Hence, in such cases, the division of the stricture should alone be the object of the operation, and not the opening of the sac. If, however, circumstances render it desirable that the sac should be opened in large herniæ suspected to contain any portion or all of the cæcum, our incision of the sac should be made at the upper part of the tumour, and more towards the mesial than the iliac side of it.

2. When the *sigmoid flexure of the colon* is in a hernial state, it usually descends fixed, in the same manner as the cæcum when in this condition, by a connexion of filamentous

tissue, either directly by its posterior surface, or through the medium of its short and imperfect mesentery. In this state it is occasionally found in inguinal hernia of the left side. I have also seen the sigmoid flexure thus constituting a ventral hernia midway between the spine of the ileum and the navel.

3. *Hernia in which the urinary bladder is the contained organ* (Cystocele). This is, in many respects, analogous to hernia in which the cæcum is the part protruded. The covering of peritoneum possessed by these viscera being partial, gives to the herniæ which they form several characters in common.

The earliest information respecting hernia of the bladder was derived from cases which had been mistaken. M. Plater, of Bâle, who lived in 1550, has related an obstinate case of retention of urine,¹⁴ in which, on examination, he found a tumour, which had appeared within a short period and had rapidly increased in size, occupying the scrotum and extending to the groin. Suspecting this to be the cause of the retention, he punctured it, and a copious stream of urine was forcibly ejected, to the great relief of the sufferings of the patient. Urine was discharged for a considerable time through the wound, which became ultimately closed. M. Mery¹⁵ was consulted by a man suffering from difficulty in evacuating the bladder. In this case there was a fluctuating tumour in the scrotum, supposed by Mery to be hydrocele. The patient soon convinced him of his error by compressing the tumour with both hands, when the urine flowed freely by the urethra, and the supposed hydrocele disappeared. Mery then concluded that the tumour was formed by a hernia of the bladder, and subsequently confirmed the opinion by dissection.

From these and similar cases the attention of surgeons became directed to herniæ in which the bladder was the protruded organ; and about the middle of the last century

M. Verdier¹⁶ presented to the Royal Academy of Surgeons a valuable memoir on the subject, in which he collected from scattered sources numerous cases of this kind, and explained the mode of its formation and anatomical peculiarities. Since the time of Verdier, the subject has received further elucidation from the writings of many British and foreign surgeons.

a. Condition of parts in which the bladder forms the sole hernial protrusion.—The bladder, like the cæcum, receives only a partial covering of peritoneum. When it is greatly distended with urine, the point of reflexion of the peritoneum from its anterior and lateral surfaces to the wall of the abdomen is elevated; and, under an extreme degree of distension, the peritoneum is sometimes raised so high as to be actually removed from the inguinal and femoral apertures, whilst the bladder itself rises considerably above them. But, however elevated this organ may be, it does not admit of being forced through the hernial apertures whilst in a state of distension, and consequently it can only be protruded through the inguinal and femoral apertures when it retains its elevated position *after* evacuation. From original conformation perhaps, but more frequently from alteration of structure in consequence of the long distension it has undergone during the existence of pregnancy or from diseases of the prostate and urethra, it contracts only feebly, and may remain in a flaccid state in the immediate vicinity of the abdominal or femoral rings. In this condition the bladder admits of being protruded through these apertures. Its anterior and lateral surfaces glide below the reflected edge of the peritoneum, and entering the hernial aperture constitute an inguinal or femoral hernia devoid of a peritoneal sac.

By subsequent distension the protruded portion of the bladder becomes elongated, and ultimately descends into the scrotum, where it assumes a pyriform shape, forming a large

pouch below, which communicates above with the general cavity of the bladder by a narrow tubular process. This pyriform prolongation of the bladder may exist without any covering of peritoneum. Such was the case in the patient from whose scrotum Mr. Pott removed a urinary calculus.

As the protruded part of the bladder, which at first is altogether unprovided with a sac, increases, it frequently drags down with it the reflected edge of peritoneum, and thus a partial sac is produced, which is, however, situated only at the front and upper part of the protrusion, as in some herniæ formed by the cæcum.

Into this sac a portion of intestine or omentum may descend, and may even become strangulated.

The superadded enterocele or epiplocele may, as it increases in size, distend the peritoneal bag and enlarge its dimensions, so that ultimately it may extend beyond the boundaries of the protruded portion of the bladder. But still this peritoneal pouch only forms an imperfect sac to the cystocele, which remains uncovered by peritoneum at its posterior surface, where it is united to the contiguous parts by filamentous tissue.

A cystocele occurring at the inguinal or femoral apertures is irreducible, except in its earlier stage, when from the extensibility of the connecting tissue, it may be pushed within the abdomen. Even in the more advanced stages the irreducible condition may sometimes be gradually overcome by prolonged recumbency, and the judicious use of pressure. When, however, the bladder has reached the scrotum, replacement is not to be expected, and prolonged attempts by the taxis or other means would be prejudicial.

I cannot forbear transferring to these pages the following report of the dissection of a cystocele, from the pen of Sir Astley Cooper: "A large inguinal hernia was perceived on the right side, which had descended into the scrotum so as to occupy its lower part; on removing the integuments, the fascia of the cord and cremaster were seen spread over the

front part of the tumour, and both somewhat increased in density. These being removed, a hernial sac came into view, formed of peritoneum, as in common inguinal hernia, and not at all changed from its usual appearance. When the cavity of this hernial sac was laid open by incision, both omentum and intestine presented themselves; the bag in which they were contained was complete, and the bladder was still concealed. I then threw air in by the urethra in order to inflate the bladder; and immediately it began to swell, not only in the pelvis, but also in the scrotum behind the hernial sac, until it became as large nearly as an ostrich's egg. The bladder was situated behind the peritoneal sac, to the posterior part of which the anterior surface of the viscus closely adhered. Posteriorly it was connected by cellular membrane to the scrotum, and to the tunica vaginalis of the cord. On tracing it upwards it was found to ascend through the external abdominal ring into the inguinal canal, where it maintained the same relative situation to the cremaster and spermatic vessels as in the scrotum. It thence extended through the internal ring up to the pelvis."¹⁷

Many cases are on record in which the cystocele has been the seat of calculus, and in several the concretions have been successfully removed by laying open the hernial tumour. Occasionally they have escaped by ulceration.¹⁷

b. Symptoms and peculiarities of a Cystocele.—A hernia of a portion of the bladder alone, is gradual in its formation, but it may receive a sudden increase in size from a superadded enterocele or epiplocele. The subject of this affection experiences difficulty in evacuating the bladder, and can seldom accomplish it completely. Hence there is a frequent desire to pass urine. The tumour generally becomes larger and more tense when the bladder is distended, smaller and more flaccid after micturition. Fluctuation is frequently perceptible, but the tumour is not translucent. The tumour may be diminished in size by compression, and this forcible

expulsion of its fluid contents is followed by an immediate desire to evacuate the bladder.

The urinary bladder has been known to constitute oblique inguinal, femoral, ventral, perineal, and vaginal hernia.

Oblique inguinal cystocele is most frequent. In this affection the bladder may protrude only into the inguinal canal, or it may, as above stated, descend to the bottom of the scrotum. It occurs most frequently in males, but it has also been seen in women. The bladder has, moreover, protruded through the inguinal canal on both sides in the same subject.¹⁹

Arnaud has related a case of inguinal cystocele supposed by some surgeons to have been hernia of the tunica vaginalis.²⁰ The subject of this case was a man who died after suffering under symptoms of strangulated hernia. On dissection, the part forming the hernia was ascertained to be the bladder, and it was known to have existed from his infancy. From the latter circumstance the inference was drawn that the hernia was congenital, or situated in the tunica vaginalis.²¹

Femoral cystocele has been observed by Verdier, Penchie-nati, and Bengnone, and in several of these instances it was double.

A case of ventral cystocele in a child fifteen months old is recorded by Stoll.²² There existed in this case a tumour above the pubes, formed by the bladder between the recti muscles.

A large proportion of perineal and vaginal herniæ are formed by protrusion of the bladder.

CHAPTER V.

STATISTICS OF HERNIA.

1. *The relative frequency of hernia in the human race*, or in the population of particular countries, has been very variously estimated. By Arnaud it has been calculated that one eighth of mankind are the subjects of it.²³ Mr. Turnbull, surgeon of the London Truss Society, states, that, “after most diligent and general enquiries throughout the kingdom, he is induced to take them, male and female, and of all ages, upon an average of 1 to 15.”²⁴ This estimate was sanctioned by Monro,²⁵ supported by the authority of Gimbernath, and was, for many years, generally adopted by European surgeons. It is undoubtedly too high, but other surgeons have erred in the opposite extreme. From a return made by Dr. Vesturme, Inspector-General of the German Legion, it appears that, of 40,460 recruits examined, 365 were rejected on account of their being affected with hernia,²⁶—nearly 1 in 111, or a little less than 1 *per centum*; and, of 12,835 recruits inspected at Dublin, 116 were rejected on account of the infirmity, or 1 in 110; and it has been supposed that these returns afford a tolerably correct view of the general frequency of hernia, at least in the male population of European states: but the estimate is obviously too low, for many persons afflicted with hernia, and knowing it to be a ground of disqualification for military service, would on this account be prevented from enlisting. A nearer approach to the truth, as far as regards the male population of France of twenty to twenty-one years of age, may be obtained from the records of

or 7 to 1. Of 474 herniæ observed by M. J. Cloquet, 307 occurred in males and 150 in females, or in the proportion of 2 to 1.* Of 526 herniæ treated at the Leeds Infirmary,† 424 were observed in males and 102 in females, or rather more than 4 to 1. In October and November, 1835, M. Malgaigne observed 410 herniæ, of which 335 occurred in men and 75 in women.²⁸ In 1836, of 2767 herniæ, 2203 were in men and 564 in women. In 1837, of 2373

* Table of 457 herniæ observed by M. J. Cloquet.

457 herniæ.	Inguinal . . .	{	Male . . .	247	{	Right . . .	133
			Female . . .	42	{	Left . . .	114
	Femoral . . .	{	Male . . .	55	{	Right . . .	19
			Female . . .	79	{	Left . . .	23
	Umbilical and Ven- tral	{	Male . . .	.	.	Right . . .	33
			Female . . .	.	.	Left . . .	22
	Obturator . . .	{	Male . . .	.	.	Right . . .	54
			Female . . .	.	.	Left . . .	25
		{	Male . . .	.	.	Right . . .	3
			Female . . .	.	.	Left . . .	21
							2
							0
							5
							3
							<hr/>
							457

† Table of 526 herniæ treated in the Leeds Infirmary from June 1st, 1839, to January 1st, 1841.

526 herniæ in 422 persons.	Inguinal . . . 433	{	Male . . . 394	{	Right . . . 244
			Female . . . 39	{	Left . . . 150
	Femoral . . . 67	{	Male . . . 19	{	Right . . . 23
			Female . . . 48	{	Left . . . 16
	Umbilical . . . 24	{	Male	{	Right . . . 9
			Female	{	Left . . . 10
	Ventral . . . 2	{	Male	{	Right . . . 24
			Female	{	Left . . . 24
		{	Male	{	Right . . . 10
			Female	{	Left . . . 14
	{	Male	{	Right . . . 1	
		Female	{	Left . . . 1	
					526

herniæ, 2884 were in men and 489 in women. From these observations he infers that the relative proportions of hernia in men and women is as 4 to 1. These statements shew a great preponderance of herniæ in the male sex; but it may be justly supposed that it is greater than really exists, since women, from motives of delicacy, as well as from their being less engaged in such laborious occupations as compel the hernial subject to seek relief, are less likely than men to be the applicants at a public institution.

3. *Relative frequency of hernia on different sides of the body.*—Hernia is more frequent on the right than on the left side of the body.

Of 4852 inguinal and femoral herniæ treated by the New Rupture Society, there were 2780 right and 2073 left herniæ, or $1\frac{1}{3}$ right to 1 left. Of 433 inguinal and femoral herniæ reported by M. Cloquet, 246 were right and 187 left, or about $1\frac{1}{3}$ right to 1 left. Of 500 inguinal and femoral herniæ observed at the Leeds Infirmary, 300 were right and 200 left, or $1\frac{1}{2}$ to 1.

4. *Relative frequency of hernia at different ages.*—This important subject has been most ably investigated by M. Malgaigne, from whose clinical lectures on hernia the following condensed statement of the results deduced from extensive statistical documents is given: “Of the whole of the hernial subjects presented at the Bureau Central, the proportion of those under the age of one year is 1 to 52, a striking difference being exhibited between the males and females under this age; for while in the former it is 1 in 38, in the latter it is only 1 in 62.” The proportion is greater in the female sex up to one year than during the whole period of life afterwards. The herniæ of this age are the umbilical, and that variety of inguinal which usually goes under the denomination of congenital hernia. To umbilical herniæ the sexes are equally predisposed at this age, and it is in respect to inguinal herniæ alone that the

striking difference in proportion between the sexes is perceived. As the canal of Nuck in females is found to be as frequently open at the time of birth as the vaginal canal in males, the greater predisposition in the latter may be attributed to the descent of the testicle through the serous canal.

From one to two years of age the proportion of herniæ diminishes greatly, and still more from two to five years.

From five to thirteen the decrease is nearly the same in both sexes, and it is particularly deserving of notice that in the period of life between the eighth and ninth years the smallest number of herniæ are found. At this period the herniæ peculiar to infancy cease to be produced, and other causes afterwards come into operation which tend to occasion new species of hernia.

After thirteen years there is a small increase, but up to the twentieth year this increase is observed almost exclusively in males. This fact may be explained by the more active habits and bodily exercises of the sexes at this period. After the age of thirteen years the amusements and occupations of boys enjoin great muscular exertion, whilst the habits of girls are sedentary. To this may in great part be attributed the greater frequency of hernia in males. From twenty to twenty-eight years there is a larger increase, greater perhaps in women than in men. In women at this period not only inguinal herniæ occur, but also accidental umbilical and femoral, which, prior to this age, are rarely if ever found. Pregnancy may, to a certain extent, account for this, for it may favour the tendency to hernia in two ways: firstly, by the direct pressure occasioned by it upon and consequent stretching of all the abdominal walls; and, secondly, this pressure may excite the fleshy fibres of the abdominal muscles to a continual though partial contraction, and thus add to that already acting upon the tendinous parts of those muscles, and upon the aponeuroses, in both of which the hernial apertures are situated. The effect of this in-

creased and unequal pressure must be to produce a great tenuity of these aponeuroses and membraniform tendons, and to dilate, probably, the hernial apertures, whereby they are rendered less able to resist pressure, especially if it be increased by the ordinary muscular efforts of the woman. The more violent exertion of the muscles, especially of those of the abdomen, in men, while engaged in their active exercises and laborious occupations, while lifting heavy weights, or from a severe and particular mode of riding on horseback, such as that adopted in cavalry regiments, may, in like manner, influence the number of herniæ in this sex.

From twenty-eight to thirty there is a great increase, particularly in women, which is probably owing to the greater development of masses of fatty tissue in the neighbourhood of the hernial apertures of females at this age; which, by separating the fibres of the aponeuroses, render them less capable of resisting pressure, and thus promote the formation of hernia, more especially of the femoral species.

From thirty to thirty-five the number is stationary. From thirty-five to forty it increases in both sexes to double the previous proportions. It is greater in men at this time than during the subsequent period of life.

From forty to fifty the number diminishes a little in men, but there is a marked increase in women, which is rendered evident by the following statement. From birth to one year the hernial females amount to half the number of males. From one to four years the proportion decreases to one-fourth, afterwards it becomes still lower, and only again rises to one-fourth about the thirty-fifth year. Lastly, from forty to fifty it reaches one-third, which is its highest proportion; for after fifty years there is an evident decrease, which M. Malgaigne attributes to the greater mortality in females than in men afflicted with hernia after they have reached the age of fifty.

From fifty to seventy the number is nearly stationary ; but from seventy to eighty it decreases one-half in men, and two-thirds in women.

5. *Relative frequency of hernia in the rich and poor.*—M. Malgaigne attempts the solution of this problem by dividing the population of Paris into three classes ; the first comprising the affluent, the second those in easy circumstances, and the third the poor ; and then ascertaining what proportion of hernial subjects occurred in the conscripts furnished from 1816 to 1823 by such parts of Paris as were more especially inhabited by one or other of these classes.

In the quarters chiefly occupied by the affluent, 1 in 37 was affected with hernia ; in those occupied by persons in easy circumstances, 1 in 38 ; and in those occupied by the poor, 1 in 28. Hence it appears that the poor are much more frequently afflicted with hernia than those in affluent and easy circumstances. Poverty and hard work may therefore be regarded as causes of hernia.

6. *Opinions relative to the prevalence of hernia, not founded on statistics.*—Many popular opinions, as well as the statements of men of science, relative to the prevalence of hernia in different districts, although not based on statistical records, may perhaps have some foundation in fact. Freytag, many years ago, noticed the remarkable frequency of hernia in Switzerland.²⁹ Blumenbach has stated that ruptured persons were very numerous in the district of Uppinzall, and he attributed the frequency of the disease in this district to the prevalence of certain violent gymnastic exercises.³⁰ According to Sir Astley Cooper, hernia is less frequent in England than in the south of Europe or in Africa. He quotes a gentleman who thus writes from Malta : “ This is the place where hernia should be studied ; for, from the extreme relaxing heat of the climate, assisted by the constant exertions which the inhabitants are obliged to make in passing their rocky paths, few persons escape the disease.”³¹ Mr.

Key is of opinion that the labouring class of Asiatics most frequently met with in this country, and known under the name of Lascars, are by no means subject to hernia; and Mr. Hyslop ascribes the comparative immunity to the indolence of the Lascars, which prevents them from ever exerting themselves to the utmost of their strength, combined with their sitting in “a position that brings the muscles which pass over the inside of the loins to the top of the thigh in great and constant action; so that these muscles must be full, hard, and unyielding, thereby filling up the space under Poupart’s ligament and the internal ring through which the spermatic cord passes.”³² Dr. Knox suspects hernia to be rare in any unmixed dark-coloured savage race, although he admits its frequency in mulattoes.

7. *Mortality of hernial subjects.*—The great mortality of persons affected with hernia will be best shewn by placing in a tabular view the relative number of hernial subjects to the whole population at different ages, according to the statements of M. Malgaigne:

Before 1 year the hernial subjects are to the whole population of this age	} as 1 in 21	
From 1 to 2 years	„	1 29
„ 2 to 3	„	1 37
„ 5 to 13	„	1 77
At 20	„	1 32
„ 28	„	1 21
From 30 to 35	„	1 17
„ 35 to 40	„	1 9
„ 40 to 50	„	1 9
„ 50 to 60	„	1 6
„ 60 to 70	„	1 4
„ 70 to 71, one-third of the whole male population.		
„ 75 to 80	„	1 4
„ 80 to 83	„	1 14
„ 83 to 86	„	1 25
„ 86 to 100	„	1 36

From a comparison of the general statistics of hernia with those which exhibit the relative mortality of the whole popu-

lation at different ages, M. Malgaigne infers that the hernial population, from the age of one to thirteen years, disappears four times more quickly than the general population.

This can only be produced in two ways, either by cure or by death. Although radical cure is possible and frequently easy at this age, yet it must be admitted that amongst the poorer classes it is rare, on account of the imperfect construction of trusses and the careless manner in which they are applied, and, above all, the continuance of the causes of hernia. But, even supposing that one-half of the hernial subjects of this age are cured, the statistical records shew that death occurs twice as frequently in hernial infants as in others; and it is important to notice that strangulation exerts but very little influence on the relative mortality.

At twenty years, the proportion of hernial subjects has again ascended, and continues increasing to forty years, when it reaches one in nine. It remains nearly stationary until the fiftieth year, when it rises to one in six; and continues to rise until the age of seventy-five, when the hernial subjects form nearly one-third of the whole male population. After this period, the influence of herniæ in accelerating death among the hernial part of the community becomes very obvious. From seventy-five to one hundred years, men afflicted with hernia disappear quickly, and even exhibit a mortality nine times greater than that of others of the same age.

M. Malgaigne further states, that the increased mortality of elderly hernial subjects is exhibited in women at an earlier age than in men, and that the proportion of females affected with hernia becomes obviously modified by the increased influence of hernia in causing death after fifty years of age; whereas, in men, on account of their more robust constitution, and greater power of resisting the destructive influence of disease, the diminution of numbers from hernia does not become very apparent until after the age of seventy-five.³³

CHAPTER VI.

CAUSES OF HERNIA.

THE causes of hernia operate either by diminishing the resistance of the abdominal walls, or by increasing the pressure of the viscera. In the first case they are termed *predisposing*, in the latter *exciting*.

The action of the respiratory muscles is the principal source of pressure of the viscera. The diaphragm contracting pushes the contents of the abdomen against the relaxed abdominal muscles; which subsequently contract, and carry the viscera against the relaxed diaphragm. During these *alternate* movements of the diaphragm and the abdominal muscles, the viscera are subject to a certain degree of pressure; but they sustain a much higher degree of compression, and consequently react much more powerfully upon the walls, when the same muscles act *simultaneously*, as during the forcible expulsion of the contents of the womb, rectum, and bladder. The strength of the walls, and the pressure of the viscera, when the walls are in their natural condition, are so admirably adapted to each other, that, under the ordinary action of the respiratory muscles, and in the natural condition of the walls, protrusion of the viscera does not occur. But when the walls are preternaturally weak, or the action of the muscles excessive, the resisting power of the former is often overcome, and hernia is produced.

1. *Predisposing causes*.—Large size of the hernial apertures exerts an undoubted influence in the production of hernia. Men, for instance, who have larger abdominal rings than

women, are the most liable to inguinal hernia; whilst women, who have a deeper and wider femoral arch than men, and usually smaller muscles traversing the space, are relatively more subject to femoral hernia.

Inordinate size of the apertures, from defective development of muscles or tendons, operates in the same manner. This condition is frequently observed at the umbilicus, from deficiency of aponeurosis in the linea alba. The external ring is also sometimes preternaturally large, from the deficiency of the intercolumnar fibres. Weakness of the walls in the neighbourhood of the external ring is occasionally still more considerable from defective formation of the lower tendinous portion of the internal oblique and transversalis muscles, predisposing more especially to direct inguinal hernia. From deficient development of other parts of the walls, preternatural apertures sometimes exist, which favour the formation of ventral herniæ. Where an hereditary tendency to the disease exists, it is probably due to defective development of the walls.

The natural openings may become enlarged from general distension of the walls by pregnancy, ascites, and obesity; hence these conditions may be regarded as exerting a remote influence in the production of hernia.

Statistical records shew a great increase of hernia after the age of twenty, when the abdominal walls of women become relaxed by repeated pregnancies. At a later period, the relaxed condition of the abdominal walls in men predisposes powerfully to the disease.

Poverty, as before stated, favours the production of hernia; but the predisposition in this case, although partly due to a relaxed and atrophied condition of the tissues, is aided by hard work as an exciting cause.

2. *Exciting causes.*—A great proportion of the exciting causes of hernia may be referred to the agency of the respiratory muscles. When the walls are preternaturally weak, the

ordinary action of these muscles is sufficient to produce the disease; and, even when they possess their natural strength, excessive action of the same muscles is a frequent cause of hernia. The latter is more especially observed in the violent simultaneous action of the diaphragm and abdominal muscles, which constitutes the act of straining, and is exemplified in those forcible efforts to evacuate the rectum or bladder which are made by persons afflicted with stricture, enlarged prostate, stone in the bladder, and constipation; in the exertions attendant upon difficult parturition, playing on wind instruments, and lifting heavy weights; and in the powerful and irregular muscular acts of vomiting, coughing, jumping, running, equitation, and some military exercises. Amongst the exciting causes of hernia must also be enumerated external pressure from articles of dress, as stays and belts, and from instruments used in some mechanical employments; and internal pressure from deposition of fat, effusion of fluid from tumours, and from distension of the viscera.

Hernia is sometimes the immediate result of blows, in which case there is generally some laceration of aponeurosis or muscle.

CHAPTER VII.

EFFECTS OF HERNIA.

WHEN a hernia is small and recent, and can be easily reduced, the protruded viscera seldom exhibit any change of structure; but when the disease is of long standing, more especially when it has attained considerable magnitude, and has become irreducible, they are frequently found congested, opaque, indurated, or hypertrophied. These structural alterations I shall have to notice more fully in the subsequent chapters. Changes of structure are not, however, limited to the parts which form the hernia. The portion of mesentery within the abdomen connected with a protruded coil of intestine is, in old herniæ, observed to be elongated, thickened, loaded with fat, and interspersed with varicose vessels. In epiplocele the abdominal portion of the omentum assumes a triangular form, the apex of the triangle being placed in the hernial aperture, and the base attached to the stomach and the transverse colon.

The hernial apertures under the distending influence of hernia become enlarged, and assume a more circular form. Their enlargement is effected, in most instances, by gradual elongation of the aponeurotic fibres, and occasionally by their separation. In old herniæ the apertures are sometimes displaced. Thus the internal abdominal ring, or rather its pelvic border, is carried downwards towards the pubes, so as to approximate the external ring; so also the umbilical aperture, or its inferior border, is carried downwards towards the pubes, by the dragging of an old and voluminous

hernia. Scarpa has noticed a displacement of the tendinous fibres at the external ring in large scrotal herniæ. The superior pillar is forced so much upwards and forwards, that the neighbouring tendinous bands are made to approach each other, and are thus gathered together at the upper part of the ring, so as to give to it a degree of thickness and hardness much greater than it naturally possesses.

Some of the structures which invest the hernia, after having been long subjected to the pressure of a large protrusion, exhibit important pathological changes. Thus the filamentous tissue external to the sac frequently becomes opaque, thickened, indurated, and separable into distinct layers. The cremaster muscle, the fascia of the cord, and the superficial fascia, also become thickened and indurated.

Herniæ, more especially when they are of large size, disturb the functions of the alimentary canal, causing flatulence, indigestion, nausea, delayed transit of food, and constipation; and, when the omentum is protruded, injurious traction of the stomach and colon, painful dragging sensations, and colic are not unfrequently produced. This displacement of the stomach, intestines, mesentery, and other chylopoietic viscera, must seriously impair digestion and chylous absorption, and the nutrition of the various tissues must consequently be much interfered with. Hence, it is not uncommon to see the subjects of hernia become emaciated, and the expression of their countenances to indicate weariness, languor, exhaustion, fatigue, and suffering, from comparatively slight exertions. In fact, the healthy performance of the nutritive processes is so much interfered with, as to render them insufficient to compensate for the waste constantly taking place in the tissues.

CHAPTER VIII.

CONDITIONS OF HERNIA.

HERNIA may exist in three states or conditions; the reducible, the irreducible, and the strangulated.

I. *Reducible Hernia.*

General characters and symptoms.—When a hernia descends and returns freely, it is said to be reducible. In this condition, the protruded parts experience but little pressure from the aperture, and their functions are not usually much interrupted; consequently the symptoms of hernia, in its reducible state, are derived chiefly from the characters of the tumour, and not from disturbance of the functions of the displaced viscera.

A tumour occurring in any of the usual sites of hernia, may be regarded as hernial, if it be firmly attached at its base, whilst the integuments move freely over its surface; and if it diminish in size or disappear in the recumbent posture, or by moderate pressure, and reappear or increase in size during muscular efforts or when the erect posture is resumed.

Other symptoms are occasionally present, which not only indicate the hernial character of the tumour, but also the nature of its contents. If, in addition to the preceding symptoms, the tumour become larger and more tense under flatulent conditions of the abdomen,—if it be the seat of rumbling sensations, or noises indicating the presence of air and fluid,—if it become tense whilst the subject of it “holds the breath,” or communicate a decided impulse to the hand

during coughing,—it may be inferred that the tumour is a hernia, and that it contains intestine.

When it is known that the tumour is hernial, it is often desirable to be able to decide whether it contain intestine or omentum. The circumstances already noticed may assist the diagnosis; but it must be confessed, that in many cases the symptoms are so obscure that certainty in the diagnosis cannot be obtained, and the surgeon is unable to advance beyond conjecture.

The circumstances which more especially characterize the presence of intestine are, the rumbling noises in the hernial tumour, particularly during its return into the abdomen, its increased tension during coughing, its uniform surface and elasticity, its return through the aperture suddenly in mass, and not gradually, and lastly, a clear sound emitted on percussion. If, on the contrary, it be flabby and compressible, free from tension, uneven in its surface, ill-defined in its outline, and return into the abdomen in successive portions without the characteristic indications of intestinal hernia, it may be strongly suspected that omentum is contained within it. Omentum is more frequently found in herniæ of the left than in those of the right side. As the omentum is short in infancy, so it is rarely observed in hernia at the groin in infants. Dr. Macfarlane has, however, witnessed an inguinal epiplocele of the left side in a very young infant.³⁴

II. *Irreducible Hernia.*

A hernia is technically termed irreducible when it cannot be returned into the abdomen by moderate pressure, and when the obstacle to its return is neither attributable to stricture nor to inflammation.

a. General characters and symptoms.—Herniæ are rendered irreducible by preternatural growth of the protruded parts, and by adhesion of various kinds.

After long residence in the sac, the contents are generally

found increased in size. The omentum, more especially, exhibits this change; and that portion of it which is embraced by the ring becomes consolidated, and converted into a firm, smooth, rounded band, whilst that which has descended into the body of the sac frequently becomes so much enlarged as no longer to admit of being returned through the aperture by which it descended. This enlargement, in some instances, is the result of simple hypertrophy; in others, a part or the whole of it is also indurated. Sometimes the enlarged omentum admits of being unfolded; but frequently it is changed into a firm, round mass, which exhibits but little resemblance to the natural structure. When much indurated, it has been described as scirrhus, without being carcinomatous. Pott has related a case in which he says the omentum was "truly cancerous." The accuracy of this opinion may, however, be questioned in this instance. The omentum has been found enlarged, moreover, from the development of serous cysts.

Enlargement of the protruded portion of mesentery and of the appendices epiploicæ, from excessive deposition of fat, may render a hernia irreducible.

Sir Astley Cooper notices an irreducible state of hernia from a kind of hour-glass contraction of the sac. But the cause of its being irreducible, in this case, does not differ materially from that which I have just been considering, namely, growth of the protruded parts; for the apparent hour-glass contraction is only the original neck of the sac, which had been pushed downwards by a fresh hernial descent. (See p. 18.)

It is doubtful whether interstitial deposition in the coats of a protruded portion of intestine can occasion sufficient enlargement of the part as to render it irreducible.

Adhesions of the protruded portions of the viscera to the body or to the neck of the sac, resulting from inflammation, are a frequent cause of the irreducible condition

of hernia. Adhesions uniting the folds of intestine or portions of omentum to each other, so that conjointly these structures form a mass too large to traverse the hernial aperture, may also produce this condition, and, when elongated into bands, they sometimes entangle the viscera, and prevent their return. But adhesions, when they exist, have not invariably this effect. Thus, a small loop of intestine, adherent to the base of the sac, which is loosely connected to the surrounding parts, may sometimes be pushed within the abdomen, dragging the sac along with it and inverting it. In other cases, a more or less considerable portion of the hernia is reducible, whilst that part only which is adherent is not. When a small loop of intestine is adherent to the whole circumference of the neck of the sac, an apparent, although imperfect, reduction may be effected by a process of invagination; the hernial loop of intestine being pushed into one of the extremities of the bowel within the abdomen, and returning into the sac as soon as the pressure is discontinued. Continued pressure, in such a case as this, might also give rise to symptoms of obstruction; and it is possible, should the patient be able to withstand the process, for a permanent cure of the hernia to take place, by adhesion of the opposite extremities of the invaginated gut, the separation by ulcerative absorption of the invaginated portion, and its discharge by the rectum. But such treatment by prolonged pressure, it is almost needless to remark, would be unwise and unjustifiable under the circumstances.

Some viscera, as the cæcum and urinary bladder, when protruded, draw down with them their natural filamentous connexions, and, on this account, become fixed at an early period of the disease to their new situations. They are consequently rendered incapable of being replaced within the abdomen, except in the early stage of their descent.

b. The diagnosis of irreducible hernia is more obscure than

that of hernia in the reducible state, on account of the absence of one of the most characteristic symptoms, namely, the disappearance of the tumour under moderate pressure or during recumbency, and its reappearance in the erect posture and under muscular efforts. But although the tumour formed by an irreducible hernia may not entirely disappear under pressure or during recumbency, yet, in many instances, it undergoes obvious variations of size from change of position or compression, and, if the early history of the case be investigated, it will frequently be ascertained that the tumour originally receded during recumbency, or could be returned into the abdomen by moderate pressure.

When the urinary bladder constitutes the hernia, the character of the tumour may be known from its diminution of size after micturition, and its gradual increase as the secretion accumulates.

c. Evils resulting from irreducible hernia.—The subject of irreducible hernia is constantly exposed to the danger of strangulation from an additional descent of the viscera. The protruded parts are also liable to inflame from trivial causes, and to suffer contusion and laceration from external violence. From the dragging produced by irreducible omentum or intestine, the functions of the alimentary canal are often seriously disturbed. This evil is sometimes greatly aggravated by pregnancy. In a case observed by Dr. Macfarlane, dragging sensations in the epigastrium, vomiting, and constipation had been experienced for several years, but these symptoms became much increased in severity as pregnancy advanced. During the last two months, the patient “was constantly confined to bed, and only experienced relief when laid on the left side, with the trunk bent forwards and the thighs drawn up to the abdomen. She could not extend herself in bed, nor assume an erect position without immediately exciting vomiting and pain in the epigastrium. The relief she experienced after delivery was very decided.”³⁶

d. Inflamed irreducible hernia. — An irreducible hernia occasionally becomes inflamed, and a state is thereby produced which might be mistaken for strangulation. Inflammation most frequently occurs in herniæ of large size, and of the umbilical and ventral species. Irreducible inguinal and femoral herniæ are, however, far from being exempt from attacks of inflammation. When inflammation occurs, the hernia becomes hot, tense, and painful; and the swelling of the protruded parts sometimes proceeds to such a degree as actually to induce strangulation. The inflammation is thereby aggravated, and the hernia frequently passes into a state of gangrene.

The diagnosis in cases of inflamed hernia is often extremely embarrassing, as the affection closely resembles strangulation, and may be ultimately complicated with it. There are, however, some points of difference which will often enable the surgeon to form a correct opinion as to the state of things. Thus, in inflamed hernia, the pain in the first instance is referred to the *body* of the tumour; while in strangulation, when the hernia is large, the *site of stricture* is more particularly the seat of pain. Again, in inflamed hernia, the ring is generally free from tension, whilst the swelling itself is tense.

Mr. Key has strongly urged the importance of establishing a correct diagnosis in inflamed epiplocele. "When," observes this excellent surgeon, "from the nature of the symptoms, the case appears to be merely an omental hernia, the operation must not be hastily proposed, for it is not easy to distinguish between the inflammation of omentum which has been irreducible, and strangulation: for the inflamed state of the omentum, without strangulation, the operation will afford no relief; on the contrary, it will aggravate the inflammation. It is highly desirable, therefore, to try the effects of active general depletion, and the application of leeches to the part; under which treatment the symptoms will often disappear."³⁷

e. Obstructed irreducible hernia.—Herniæ irreducible from adhesions or other causes are liable to become obstructed, independently of strangulation or inflammation, although inflammation of the protruded part may ultimately supervene.

The angle, more or less acute, which the alimentary canal sometimes forms in consequence of being bound to the hernial sac by adhesions, occasions a certain degree of impediment to the passage of its contents; and this may amount to complete obstruction, when substances of a more solid character reach the distorted part of the canal, or when some relative change of position has occurred between the hernial portion of intestine and that within the abdomen. The chief symptoms resulting from this state are constipation more or less complete, and vomiting, usually at long intervals; whilst the hernia for a considerable time remains free from acute pain or tension.

Arnaud recognised this state of hernia, and accomplished its relief by opening the hernial sac, and releasing the intestine from its adhesions.³⁸ The patient was a female who had been affected with irreducible femoral hernia ten years; the bowels became obstructed, vomiting occurred at considerable intervals for seventeen days, and griping pains in the abdomen, which however were slight. Believing the obstruction to be dependent upon adhesions of the intestine to the sac, he exposed the protruded part, which was firmly fixed by numerous tendinous bands. After the last of these was divided, the intestine, which was somewhat inflamed, spontaneously returned into the abdomen; the symptoms ceased immediately, and the patient quickly recovered.

Mr. Stephens has lately directed the attention of surgeons to this subject, and has advanced two cases in support of the opinion that irreducible hernia occasionally becomes obstructed in consequence of adhesions, whereby the bowel is fixed in an angular form, and its peristaltic action interrupted.

The subject of his first case was a female, who had been seized with vomiting, pain in the abdomen, and constipation. On the third day the matter vomited was of a fecal character. Notwithstanding the use of active purgatives and clysters, the symptoms continued unabated until the seventh day, when an irreducible ventral hernia was detected, which had existed twenty years. The tumour was neither tense nor painful. It receded under the touch, and passed readily into the abdomen with a slight gurgling, but returned when the pressure was removed. On the twelfth day Mr. Stephens cut down upon the hernia, and found within the sac a portion of small intestine which was irreducible, and another portion which could readily be returned. The irreducible portion was united closely to the sac by adhesions, "so as to obstruct, to all appearance, its peristaltic action, and to prevent the due course of its contents." There was not any stricture; the finger could be passed readily through the neck of the sac into the abdomen by the side of the intestine, which was somewhat discoloured. Having divided the adhesions by the knife and the finger, Mr. Stephens returned the intestine into the abdomen; the vomiting ceased, the hiccough abated, and the countenance of the patient became less anxious. After three days the bowels acted freely, and the patient rapidly recovered.

In the second case, a small portion of intestine "closely adhered to the sac, and was doubled upon itself, so as effectually to obstruct its peristaltic action and the passage of its contents." There was no stricture.³⁹

The facts which have now been adduced are sufficient to prove, in the first place, that dangerous, if not fatal obstruction of the bowels may occur, in consequence of the intestine being fixed in an angular or distorted form by adhesions between the protruded viscus and the sac; and, secondly, that such a state of obstruction may sometimes be relieved by dividing these adhesions.

But whilst these facts should never be lost sight of, nor be without their full influence in practice, it is necessary to use caution against committing the dangerous error of imputing to adhesions *all* obstructions occurring in hernial subjects not labouring under strangulation, and of rashly proceeding to attempt their removal by operation.

It must be remembered that the cases which would justify this mode of proceeding are extremely rare; that the very adhesions which are supposed to have produced the obstruction have existed probably for years; and that it may depend upon some temporary superadded cause, as the presence of crude undigested food, which, by the natural efforts, or by medicine, may be removed. I may also add, that there is no necessity in these cases for hasty interference, since their progress is far from being rapid: and, consequently, that time is afforded for the judicious employment of less hazardous measures. Above all, it should be remembered that there is much greater danger in opening the sac of a hernia which is not strangulated, and thus exposing the general peritoneal cavity, than in opening the sac of a strangulated hernia, which is usually excluded from the general serous bag by plastic effusion near the mouth of the sac.

III. *Strangulated hernia.*

A hernia is said to be strangulated when it is so constricted that the functions of the protruded parts are interrupted, or the circulation in their blood-vessels is materially impeded.

To the slighter degrees of constriction Scarpa and Sir Charles Bell applied the term *incarceration*; whilst they limited the term *strangulation* to the more severe forms. There is however no definite line to be drawn between them, and the former state readily passes into the latter. Such a division, moreover, is of no practical importance.

The contents of a hernia may, to a certain extent, be constricted for two or three weeks without gangrene or any very

urgent symptoms being produced; but a sudden irruption of a fresh portion of intestine, or the generation of gas in the portion already protruded, may induce a complete strangulation. In this case the blood in the intestine soon stagnates, gangrene with all its concomitant symptoms speedily supervenes, and the patient's life may be destroyed within twenty-four hours.

Strangulation may occur at any period of life: neither advanced age nor infancy are exempt from it. I have operated for strangulated hernia upon a child under two years of age. Dupuytren⁴⁰ operated upon an infant twenty days old.

It may be stated as a general rule that the smaller the size of the hernia, the more rapidly does complete strangulation occur. Tumefaction of the protruded parts, rendering them too large to repass the opening by which they descended, is the immediate cause of strangulation. If a portion of intestine be forcibly pushed through a hernial aperture, it might be replaced immediately by the exercise of a similar degree of force; but, if the portion at the ring be tightly constricted, the veins become gorged with blood, consequent effusion into its tissues takes place, air and fluid are secreted within its canal, and the protruded mass is thus rendered so large as no longer to permit of its being replaced by the same degree of force which caused its descent, or perhaps by any degree of pressure that may be prudently employed. To this state of things the term strangulation has been very properly applied. Surgeons avail themselves of the knowledge of this condition of the parts within the hernia in treating with the taxis; and they consequently direct their efforts in the first instance towards diminishing the bulk of the tumour, by endeavouring, by means of equable pressure upon its distal end, to propel the flatus and fecal matters which may be in the strangulated intestine, back into the neighbouring portion of intes-

tine within the abdomen; which being accomplished, they then proceed to effect its replacement.

Mr. T. Wilkinson King has shewn that most herniæ exist for years before they become subject to dangerous strangulation. He proves this position by reference to ninety-eight cases of strangulated hernia requiring surgical interference. Of these, ninety-four were in various degrees "old." The greater tendency of old herniæ to become strangulated, Mr. King attributes to a certain decline of vigour and health, connected with a manifest deterioration of the great depurative organs of the body in persons of middle and advanced age, which renders the protruded part more liable to tumefaction, so that it becomes strangulated in consequence of its own ready turgescence.⁴¹

From what has been just said it will be seen, then, that the structures immediately surrounding the seat of constriction perform in most instances a merely passive part. In consequence of their being inelastic, non-contractile, and, I might add, inextensible, they simply embrace and tightly constrict the viscera at the ring, when the latter have been protruded in such quantity, or have become so much enlarged by the causes above enumerated, as to preclude the return of the venous blood from the part, as well as that of the viscera into the abdomen.

Richter has enumerated a *spasmodic* variety of strangulation, which he supposed to exist at the external ring, in consequence of spasmodic contraction of the external oblique muscle. But, as this aperture is entirely aponeurotic and osseous, it becomes matter of doubt if the contraction of the muscle can produce any alteration in the size and form of the ring. The only well-marked instance of spasmodic strangulation is that which Sir Astley Cooper has shewn to be produced at the internal ring, and in the course of the inguinal canal, through the agency of the lower part of the transversalis muscle.

α. Seats of stricture.—The stricture may be formed by parts external to the sac, or by the sac itself, or its contents.

The parts external to the sac capable of constricting a hernia are the hernial apertures, and the sheath of the femoral vessels. The hernial apertures are frequently the seat of stricture in most species of hernia. An accidental hernial aperture, formed by the separation of the lower tendinous fibres of the transversalis muscle, has been known to constrict a *direct* inguinal hernia.⁴² In femoral hernia the stricture is frequently formed by the sheath of the femoral vessels. Sir Astley Cooper has described and delineated a transverse band of fibres which stretches across the upper part of the femoral sheath, and is incorporated with it. The resistance these fibres afford, may be rendered evident by passing the finger down into the femoral sheath, and then pressing it forwards after Poupert's and Gimbernat's ligaments have been cut away. Mr. Key has strongly pointed out the importance of these fibres in reference to strangulation. The sheath of the spermatic vessels is so delicate in its structure, that I consider it altogether incapable of exercising any powerful constriction.

The neck of the sac frequently forms the stricture in old herniæ, particularly in such as have been long treated by trusses. It has been already shewn that the neck of the sac has a tendency to become thickened, indurated, and fibrous; in which state it is rendered incapable of yielding, and may thus exert a most injurious pressure upon a hernia. Frequent disputes have arisen as to the possibility of the neck of the sac producing stricture. I need not adduce further proof of such possibility than the cases which have been many times observed and recorded of hernia reduced in mass; the hernia and its sac being returned together into the abdomen, and the strangulation still continuing.

Other parts of the sac, besides its neck, are occasionally the seat of stricture. Scarpa, Pott, and Mr. Lawrence have

recorded cases in which the stricture was apparently formed by the body of the sac. In the case observed by Scarpa, and examined by him after death, the sac presented two compartments, one above the other, which were separated by a hard ring with an elevated margin. Both compartments were occupied by a loop of small intestine. It was not difficult in the dead body to draw up the larger portion of the intestinal loop, and to make it pass into the abdomen; but, as soon as an attempt was made to draw back the portion of intestine which was in the lower pouch, considerable difficulty was experienced in making it recede through the opening of communication between the two compartments of the sac.

I suspect, in all such cases of strangulation, apparently caused by the body of the sac, that the constricting part is the original neck of the sac pushed downwards by a first hernial descent (see page 18). Wrisberg has noticed a stricture formed by an orifice at the bottom of the sac communicating with the tunica vaginalis. He attributes the constriction in such cases to a partial union of the neck of the sac, and the accomplishment of the natural process of obliteration. Dupuytren has met with stricture between the front of the sac and the back of a hydrocele, and frequently at the orifice of cells.⁴³ Sir A. Cooper has recorded an instance of stricture in an umbilical hernia formed by the mouth of a supplementary pouch. Scarpa, Cooper, and Dupuytren have known stricture produced by a laceration of the sac from external violence. Membranous bands extending across the body or the mouth of the sac have also frequently caused stricture.

Scarpa has described at considerable length the various ways in which the omentum may produce stricture. A fissure in the omentum with hard and thick edges, and an indurated band of this substance, have been known to strangle a portion of intestine.

Instances of double or triple stricture in the same subject

are occasionally observed.⁴⁴ In operating for strangulated hernia, it is not unusual to find the viscera strictured by the lower part of the neck of the sac; and, after this is divided, a second stricture formed by the upper portion of the neck of the sac. This is most frequently observed in hernia of the tunica vaginalis, from irregular and imperfect contraction of its funicular portion. An oblique inguinal hernia is sometimes strictured below, by the external ring; and above, by the lower part of the transversalis muscle, or by the neck of the sac. A femoral hernia is sometimes strictured both by the femoral sheath and the neck of the sac.

In these cases, where there exists a plurality of strictures, each would alone be sufficient to prevent the return of the hernia, although the parts may not be embraced with equal tightness by all. Ignorance of the possible existence of more strictures than one has, I believe, led in some instances to the reduction of the hernia along with its sac.

The diagnosis of the seat of stricture is a subject of great difficulty, and in most instances a very vague conjecture only can be formed in reference to it. Attention to the following circumstances may to a certain extent assist our judgment.

In recent herniæ, the sac is not the seat of stricture. In such cases constriction is produced by the sheath of the femoral vessels, or by the hernial apertures.

In old herniæ, especially such as have been treated by trusses, the neck of the sac, from having undergone the fibrous transformation, is a probable seat of stricture; but, even in such cases, the constriction may be produced by parts external to the sac.

When old irreducible herniæ become strangulated, the possibility of stricture from adhesion within the sac ought never to be lost sight of.

In some cases of strangulated inguinal hernia, the external ring feels firmly distended by the tumour, and the inguinal

canal soft and free from tension. The inference in this case is tolerably clear that the stricture is formed by the external ring. If, on the contrary, the external ring is wide, and the hernia can be moved freely within it, and the inguinal canal is occupied by a firm, unyielding substance, it is evident that the stricture is situated at the upper part of the inguinal canal, where it may be formed, either by the muscular parts which constitute the internal ring, or by the neck of the sac.

β. Pathological effects of strangulation.—Under strangulation, the intestine, as before remarked, becomes congested, inflamed, and often gangrenous.

Congestion is evident at a very early stage of strangulation. The minute veins of the intestine are turgid and distinctly visible until they are obscured by blood effused beneath the peritoneum. The colour of the congested part exhibits various shades of brown, purple, and black. By congestion alone, without gangrene, these dark shades of colour are frequently produced; but the part retains its lustre and natural firmness of texture. The capillaries pour out various excessive and morbid secretions. Serum, sometimes of a sanguineous tint, is effused into the sac, the coats of the intestine are thickened from interstitial deposit, and secretions of air and fluid are poured into the interior of the bowel. Hence the tumour becomes larger and more tense.

When inflammation supervenes, the intestine gradually assumes a redder tint. A layer of lymph is frequently effused upon its peritoneal coat, and it becomes agglutinated more or less extensively to the sac. The serum in the sac is rendered turbid by flakes of lymph.

From the continuance of constriction, or the progress of inflammation, the protruded intestine is deprived of its vitality, either throughout its whole extent, or in circumscribed spots or patches. The gangrenous part loses its lustre, and becomes soft and lacerable; and its peritoneal coat admits of being

easily detached. The colour of the dead portions of intestine varies under different circumstances. It is ash-grey or greenish when the gangrene results from inflammation; and the intestine is of an uniform dull black aspect when interstitial effusion of blood has taken place, and the gangrene is the more immediate result of congestion. If the life of the patient be prolonged, the gangrenous parts are detached by ulceration.

At an early period of strangulation, when the stricture is tight, the part immediately embraced by it shews an evident line of indentation. The mucous and muscular coats, in this situation, are sometimes destroyed by ulceration, and the peritoneum alone remains, which occasionally is soft and lacerable, and sometimes even perforated. In some cases, the mucous membrane, at the part strictured, is puckered, and forms a kind of valvular projection into the interior of the bowel, whereby its calibre is diminished. It is important, in this condition of the bowel, that the operator, after having divided the stricture, should draw down the intestine, and, by moderate extension of the part, restore the natural calibre of the bowel.

When the omentum is strangulated, its veins become turgid from congestion, and, under inflammation, it assumes a reddish colour. As soon as it loses its vitality, the blood is coagulated in its veins; it assumes a dirty green hue, and exhales an offensive odour.

The sac frequently participates in the inflammation, especially when serum is not effused in sufficient quantity to prevent the sac from lying in contact with the inflamed viscera. The inflammation soon extends from the sac to the structures external to it; the integuments become red and oedematous, and, after some lapse of time, livid and emphysematous. Ultimately, gangrenous patches, more or less extensive, are detached by ulceration; and a free communication is established between the already perforated

bowel and the exterior of the body. Fæces are discharged by the preternatural opening, the symptoms of obstruction are relieved, the further progress of inflammation and gangrene is arrested, and life is occasionally, although rarely, preserved under these trying circumstances by the unaided efforts of nature.

Whilst these changes are proceeding in the hernia and its envelopes, important alterations occur within the abdomen. At an early period of strangulation the peritoneum becomes inflamed. If the constitution of the patient is sound, the peritonitis is limited in extent, and of a healthy restorative character. In this case the effusion resulting from the inflammation consists chiefly of plastic organizable matter, which agglutinates the portions of intestine in the vicinity of the hernia to each other, as well as to the mouth of the sac and neighbouring parietal peritoneum. But in subjects in whom the constitution is impaired or was originally bad, and even in healthy persons when they are exposed to unfavourable local circumstances, the inflammation of the peritoneum frequently assumes a diffuse character, and, instead of being limited to the neighbourhood of the ring, it quickly spreads over the whole extent of the serous membrane of the abdomen, rapidly exhausting the powers of life. Even in this diffuse form of inflammation, there is usually some plastic effusion in the neighbourhood of the ring, or between the coils of intestines; but the general product of the inflammation is a turbid serum, containing soft flakes of lymph, prone to decomposition, and possessing acrid or even poisonous properties. The deleterious nature of the effusion in diffuse peritonitis, from what cause soever it may arise, is proved by the pustules which frequently form on the hands of the operator who has conducted the examination of the dead body, and the serious constitutional symptoms which sometimes follow. The following most distressing evidence of the pernicious influence of these

morbid secretions has come within my own knowledge. One evening, at the dissection of the body of a patient upon whom I had operated for strangulated hernia, several surgeons were present. Of these, two attended one case of midwifery each during the following night, and a third three cases. The two patients attended by the first two surgeons died of puerperal fever. Two of those attended by the third surgeon also died; and his third patient escaped death from this formidable malady with the greatest difficulty, after having been in extreme danger several days. It is an important fact, that no other cases occurred in the practice of these gentlemen. Mr. T. W. King, in the paper to which I have before referred,⁴⁵ has shewn that diffuse peritonitis, attended with unhealthy and unorganizable secretions, is the usual cause of death when hernia proves fatal.

The morbid appearances within the abdomen are not however limited to the peritoneum. The portion of intestine above the strictured part is distended with gas and fluid, and its coats are highly vascular, and sometimes even gangrenous; whilst the intestine below the stricture appears of small size, collapsed, and natural in appearance.

When death occurs after the strangulated intestine has been replaced by operation, the part which has suffered strangulation may generally be recognised by its deeper tint of colour, which has been known to continue fifteen or twenty days after the operation. The discoloured part is sometimes distinctly defined by two annular contractions; occasionally, where the bowels have not been able to resume their natural action after the operation, the portion of intestine above the stricture remains red, and distended.

γ. *Symptoms of strangulation.*—The symptoms of strangulated enterocele may be arranged in two groups; one owing to or depending upon obstruction of the intestines, the other

resulting from congestion or inflammation of the protruded parts and their envelopes.

The symptoms more immediately dependent upon obstruction are, constipation, vomiting, eructations, colicky pains, flatulent distension of the bowels, sense of constriction around the waist, tension of the abdomen, and ultimately tenderness on pressure. Those which are produced by morbid changes in the protruded parts and their envelopes are pain and tension of the tumour, and, in the advanced stages of strangulation, redness and tumefaction of the skin.

In the slighter degrees of strangulation to which the name incarceration has been applied, the symptoms indicating obstruction are the most prominent, and are regarded by the patient as the most important; whilst, in the more acute forms of constriction, those referable to the morbid condition of the tumour at an early period assume a high degree of intensity, and excite the attention of the patient.

When intestine becomes strangulated, obstinate constipation is generally the result. The passage of the intestinal contents from the upper to the lower part of the bowel is mechanically interrupted; and the lower portion of the intestinal canal is, in most instances, unable to unload itself, in consequence of the peristaltic action being arrested. Exceptions, however, are occasionally observed. For instance, the rectum sometimes makes a single and sudden effort to unload itself immediately after strangulation has occurred; and, in those cases in which a small portion only of the cylinder of the intestine is embraced by the stricture, fecal matter may sometimes pass.⁴⁶ Morgagni has related a case in which a part only of the cylinder was included, and the natural fecal evacuations were not suppressed, and yet the disease proved fatal.⁴⁷

Mr. Tyrrel observes, in reference to a case under his care, "that the lower intestine had been much loaded at the time the hernia was strangulated; and that either the injection

stimulated it to act, not once only, but three or four times, or that the sympathetic influence of the purgatives taken into the stomach had produced an action on the lower part of the bowels."⁴⁸ In this case the entire calibre of the intestine was girt by a very firm stricture. This is only one out of several cases in which Mr. Tyrrel has known a free action of the bowels during the existence of perfect strangulation. More frequently, in such cases, the constipation is complete. The natural movements of the bowels being arrested at the strangulated part, inverted peristaltic action soon occurs. The stomach first ejects its own contents; afterwards, bile and some of the contents of the upper bowel are vomited; until at length the ejected fluid often possesses a fecal odour, unless the obstruction be seated at the upper part of the intestinal canal. A stercoraceous odour of the matter vomited must not, however, be regarded as a decisive proof of its having proceeded from the large intestine, since the contents of the ileum may assume a fecal character when obstruction exists, even if they do not always possess it. The intestine above the stricture becomes inflamed, and morbid secretions are copiously effused into its interior. Hence there is an abundant supply of gas and fluid, which are either ejected by vomiting and eructation, or they produce distension of the intestine and a tympanitic condition of the abdomen. The distended coils of intestine are frequently perceptible to the touch, or even to the sight; they are more or less tender on pressure, especially in the neighbourhood of the strangulation; and they are frequently the seat of distressing colicky pains, produced by violent irregular and ineffectual peristaltic action. A sense of constriction is very generally felt either in the region of the diaphragm or near the umbilicus.

As the peritoneal inflammation becomes more general, serous effusion occurs, and the abdominal muscles become rigid; the abdomen is hard and tense; the coils of intestine,

formerly visible, are now concealed by the general tumidity and tension; the abdomen becomes more painful on pressure; the patient lies on the back with the thighs flexed upon the abdomen, so as to relieve as much as possible the distressing feeling of tension; and after some lapse of time gangrene occurs, which is generally known by the sudden cessation of pain. It is here necessary to caution the inexperienced against making a more favourable prognosis of the case from this sudden cessation of pain, which, instead of leading to a favourable issue, is generally the harbinger of a speedy fatal termination to the patient's sufferings.

On the occurrence of strangulation, the tumour, previously soft and indolent, becomes more or less tense and painful; but, when the strangulation is not complete, the pain in the hernia is often so slight as to be disregarded by the patient, whose complaints are referred exclusively to the abdomen. Under these circumstances the hernia is very likely to be overlooked, provided the surgeon's attention be not directed to it. When, on the contrary, the intestine is tightly stric-tured, the tumour is usually painful from the commencement. As effusion occurs into the sac, and into the coats and cavity of the protruded intestine, the tension and swelling of the hernial tumour increase, and it becomes more painful on pressure. Gangrene, however, soon supervenes, and the pain becomes suddenly mitigated. The integuments, moreover, soon become red and œdematous, and ultimately exhibit a gangrenous appearance.

The countenance is generally expressive of anxiety from the first, but becomes much sunken on the supervention of gangrene. The pulse, usually small and hard in the early stage, gradually assumes a more thready character until the stage of gangrene arrives, when it becomes softer and fuller, but frequently intermittent. It soon, however, begins to fail; and, as death approaches, becomes extremely frequent, feeble, and irregular.

In the early periods of strangulation the temperature of the skin is generally below the natural standard, and there is a good deal of chilliness with occasional rigour; but during the inflammatory stage an imperfect pyrexial state exists, the trunk and limbs feeling dry and a little hotter than natural, whilst the feet are generally cold. When gangrene occurs, the general surface of the body becomes cold, and is often profusely bathed with perspiration.

The symptoms dependent upon strangulation of the omentum are generally much less intense than those which are caused by constriction of the intestine.

Constipation is less complete, for stools may, in most instances, be obtained by purgatives and clysters; yet sometimes constipation attends strangulated epiplocele, but it may in most instances be traced to peritonitis which has supervened. Hiccup, nausea, and dragging sensations are often experienced. Vomiting is less frequent and severe than when the intestine is strangulated, unless the peritoneal inflammation is extensive. The pain and tension both in the abdomen and in the tumour are more moderate; and the pulse, although small and frequent, is not so remarkably thready.

CHAPTER IX.

TREATMENT OF REDUCIBLE HERNIA.

1. *Palliative treatment*.—In the palliative treatment of reducible hernia, the primary object should be to endeavour to retain the viscera within the abdomen by various mechanical means calculated to give artificial support to the weak parts of the abdominal walls.

Trusses. — Retentive hernial bandages or trusses are of very ancient usage. Ætius in the sixth century employed a soft compress retained in position by a soft bandage. In the thirteenth century, pads of wood and of iron, with a girdle of some soft material, were used in Italy. Gordon in 1306, and Gatenaria in 1480, recommended a girdle of iron, which afterwards fell into disuse, and gave place to the soft girdle with a hard compress of wood or metal. At the commencement of the seventeenth century, Fabricius Hildanus employed trusses composed of very soft and flexible iron, which would admit of being moulded into various forms. In 1665, Mathias Mayor first recommended elastic bandages of steel; and the same material was afterwards employed by M. Blegny, and was brought by him into extensive use.

Construction of Trusses. — Hernial bandages essentially consist of a girdle which embraces or surrounds the body, and a compress or pad adapted to the size, form, and situation of the hernial aperture, and the condition of the hernia.

Girdles composed of soft materials, as linen, calico, and leather, have for a length of time been almost entirely superseded by elastic belts of steel. Although they are much

inferior to the latter in general usefulness, they have, perhaps, fallen into greater disrepute than they deserve. It should not be forgotten that for many centuries such girdles were alone employed, and that the advantages resulting from their use were so important as to secure for them very general adoption. As a provisional measure, a soft bandage, with a firm prominent pad, may frequently be employed with advantage in the herniæ of adults; and, in the treatment of umbilical hernia in infants, a soft bandage, retaining in position a hard pad of wood or ivory, is far preferable to the steel spring. Of late, a "lever-truss" with a soft girdle has been introduced into practice.

Girdles of flexible iron, as used by Gordon and Gatena-ria, have no advantages over soft bandages, and are much more incommodious; they are therefore universally rejected in the present day.

Elastic girdles of steel possess properties of the highest value for the construction of trusses, and are more generally applicable than girdles composed of any other material. They may be made to exert the precise degree of pressure that is required, whilst at the same time they accommodate themselves to the varying form of the abdomen. These girdles, or springs, are covered with varnish to protect them from the corroding influence of the cutaneous secretions. They are also padded with wool, and covered with soft leather, to prevent them from exerting injurious pressure upon the skin.

The *pad* of the truss constitutes the medium through which the pressure is exerted, and on its good construction the efficiency of the instrument in a great measure depends. The size of the pad should bear relation to that of the aperture or canal requiring artificial support. It is usual to allow it to extend two or three lines in every direction beyond the boundary of the aperture or canal. The form is varied according to circumstances; being circular, oval, or

triangular. It is generally convex when used for reducible hernia ; and the degree of convexity is varied according to the size and situation of the aperture, and the structures in which it is seated. When a concentrated pressure is required, a pad of great convexity and small size is employed ; when, on the other hand, a more extensive and general support is to be given, one less convex and of larger size is used.

The properties of hernial pads greatly depend upon the materials of which they are composed, and an almost endless variety of substances have been employed in their construction. According to the materials of which they are composed, they may be arranged under the following heads : 1st. Soft inelastic pads ; 2nd. Pads with a hard nucleus and soft exterior ; 3rd. Hard pads ; 4th, Elastic pads. Each of these kinds of pad is worthy of a brief notice.

Soft inelastic pads, or simple compresses of lint or linen, do not possess sufficient power of resistance. They are incapable of resisting the protrusion of the viscera, and by continued pressure become altered in form.

Pads consisting of a hard nucleus and soft exterior are extensively used. They are usually formed of a piece of cork, wood, or convex metal, which is covered by a few layers of flannel, enveloped in leather, and attached to a metallic plate. Instruments thus constructed retain their form, and, whilst they possess a certain degree of softness, are sufficiently resisting.

Hard pads of wood or ivory were used in the sixteenth century, and, after having been long discontinued, have of late been again employed. Stagner, in America, endeavoured to promote the radical cure of hernia by the use of rough wooden pads so applied as to excite irritation in the parts upon which they pressed, and thereby to produce the condensation and adhesion of the skin, superficial fascia, and the abdominal tendons. Their employment, however, was productive of severe pain and other evils ; and, moreover, not

only failed in effecting the radical cure of the hernia, but even in securing its temporary retention.⁴⁹ These pads have been greatly improved by several American surgeons, more particularly by Dr. Hood and Dr. Chase, who have given to them a smooth surface, and have modified their form according to the different canals and apertures they are intended to support. The object of these surgeons in the employment of solid pads is not to promote inflammation and consolidation of the compressed parts, as was attempted when Stagner's blocks were used, but merely to secure the perfect retention of the viscera, and thus not only effectually to palliate the evils resulting from the disease, but also to allow nature to effect the permanent contraction of the hernial aperture, which in many instances was the result. Dr. Chase has extended his improvements to all parts of the truss. The Philadelphian Committee report of Dr. Chase's truss, that it is "worn with so much comfort that patients generally relinquish it unwillingly, and sometimes absolutely refuse so to do, even when pronounced cured by the surgeon." The trusses adapted by Dr. Chase to the different varieties of hernia will be hereafter alluded to.

Pads of ivory, confined by plasters or a soft bandage, are of great value in the treatment of the umbilical herniæ of infants. I have also found ivory pads with a delicately adjusted spring efficient and cleanly, and not productive of pain, in the treatment of inguinal hernia in infants. M. Malgaigne has found an ivory pad, of a mushroom form, supported by a common spring-truss, of great value in some obstinate direct inguinal and umbilical herniæ.

Whenever hard pads are employed in conjunction with a steel spring, the greatest care is necessary in regulating the degree of pressure of the spring, and in giving to the pad a proper form and smooth surface; otherwise, the structures to which the pad is applied may be seriously injured.

Elastic pads of caoutchouc filled with air have been adopted

by MM. Cresson and Sanson. These pads succeeded admirably in preventing the descent of herniæ the most difficult of retention, whilst, at the same time, the pressure which they exercised was borne with perfect ease; but unfortunately, after a time varying from two to twelve months, it was found that the air gradually escaped from the caoutchouc, and the hernia ceased to be retained.⁵⁰ To obviate this defect, M. Cresson constructed an apparatus whereby air could be injected into the pad whenever a fresh supply was necessary. The expense, however, of this instrument will prevent its general use, but M. Malgaigne is of opinion that trusses constructed upon this principle are not entirely to be rejected, for he found, in a very obstinate case of direct inguinal hernia, that one of Cresson's trusses afforded great relief when all other kinds of pads which had been tried were insupportable, from the pressure they exerted upon a prominent spine of the pubes. Caoutchouc filled with curled hair, or a solid mass of this substance, is a good substitute for the pads of M. Cresson. Whenever caoutchouc is used as a compress for trusses, a layer of linen should be placed between it and the skin.

In the trusses in common use in England, the spring is either firmly riveted to the metallic plate which supports the pad, or the spring and plate are formed of one continuous piece of metal. Sometimes these parts are attached by screws, which allow of the pad being moved to any required angle, and fixed in that position. For the same purpose, a kind of rackwork is occasionally employed. In the inguinal trusses of Dr. Chase the pad can be moved to the extent of an inch in a direction towards the pubes, along a sliding apparatus, and there fixed by means of two screws. The pad is moreover connected to the spring by a round neck of soft iron, about three-quarters of an inch in length, sufficiently stiff to resist any change of form during the most active movements of the patient, and sufficiently pliable to act like an *universal joint* under the hands of the

surgeon. By the combined action of the slide and the neck, the pad may be adjusted "with the utmost precision to the edge of Poupart's ligament, the route of the abdominal canal and the internal ring, whatever may be the peculiar form of the abdomen."⁵¹

In the trusses of Salmon and Ody the spring is attached to the pad, through the medium of a short stem placed at right angles with the pad, and united with it by a ball-and-socket joint. Uniform pressure is thus maintained by the apparatus during the varying positions of the spring of the truss and the body of the patient. Trusses constructed upon this principle have been repeatedly denounced as theoretically bad; yet I have known many patients who have worn them with the most beneficial results after the common spring-trusses had failed to give relief. Sir A. Cooper used to recommend them for those persons who had not "to earn their bread by the sweat of their brow;" but M. Malgaigne, whose extensive experience at the *Bureau Central* gives great weight to his opinion, states that Salmon's truss is the most efficient instrument for relieving inguinal hernia even in the labouring classes.

The imperfect circle formed by the spring, in many kinds of trusses, is rendered complete by a strap passing from the free extremity of the spring to the pad. The spring, being the agent employed for exerting pressure upon the pad, should be so constructed that the truss maintain its position and attachment under the ordinary movements of the body, without the aid of the strap. The latter is added merely as a security against displacement under violent efforts. It should not be so tightly fixed, therefore, to the button as to exert pressure on the pad under ordinary circumstances, but yet sufficiently tight to resist any sudden and violent tendency to displacement. If the body of the patient be naturally formed, the pad of the common spring-truss ought to rest in its proper position without the aid of straps passing under the thighs or over the shoulders.

Under some peculiarities of figure, however, such appendages are occasionally necessary. The perineal strap forms an essential part of Chase's truss and of Evans' patent lever-truss. (Moc-Main truss.)

It is of the greatest importance that patients should not only be furnished with an efficient truss, but also that they should be instructed in the principles upon which it acts, and the correct mode of its application. I have frequently witnessed patients whose herniæ had partially descended by the side of the truss, in consequence of the imperfect application of the instrument. The truss should always be worn both during the night and day. By neglect of this rule the danger of strangulation is incurred. During the simple act of turning in bed, or during the more violent efforts of coughing or yawning, the unsupported hernia may descend and may become strangulated. On this account, it is desirable that the patient should be provided with two trusses, that the hernia may not be left unprotected whilst the instrument requires occasional repair.

When the viscera are perfectly retained by trusses, the neck of the sac, no longer distended, contracts, and may become ultimately closed. So, also, the aperture in the abdominal muscles and aponeuroses, through which the hernia had descended, when no longer traversed by the protruding viscera, becomes gradually diminished, to such a degree as, in some instances, to constitute a permanent barrier to the future descent of the bowel. Thus, whilst the surgeon employs trusses as the most effectual agents in the palliative treatment of hernia, he is, at the same time, adopting means of considerable power for promoting the radical cure of the disease. But, whilst the palliative and remedial value of trusses is acknowledged, it must not be concealed that their beneficial effects are not altogether unalloyed with evil. The contraction and induration of the neck of the sac, consequent upon their

use, renders it less yielding, and the abdominal viscera more liable to strangulation, if at any time they should accidentally descend.

2. *Curative treatment, or radical cure of hernia.*—Since hernia, in all cases, results from some portion of the walls of the abdomen and pelvis being either absolutely or relatively weak, so that they are unable to resist the pressure of the viscera, it follows, that the means calculated to give permanent relief to this malady must have for their object the strengthening of such portion of the walls as may have yielded to the pressure.

Much ingenuity has been expended, from the time of Celsus to the present day, in attempting to accomplish this object. Some of the means which have been suggested are so barbarous as to deserve the severest condemnation; some so ineffectual as scarcely to merit a passing notice; whilst others have been attended with such a degree of success as to demand the serious consideration of the surgeon.

The various means which have, from time to time, been recommended for the radical cure of hernia, produce their real or supposed effects, either by causing the closure or destruction of the sac, or by indirectly promoting the contraction of the hernial aperture.

The first of these objects appears to have exclusively occupied the attention of many surgeons who have attempted the radical cure of hernia, and undoubtedly they have attained their object as far as the closure or destruction of the sac was concerned; but, unless there be also simultaneous contraction of the hernial aperture, very little advance towards permanent cure of the disease is made. They have, indeed, substituted a layer of peritoneum across the hernial aperture in the place of the open mouth of the sac, but the resistance thus afforded by a mere barrier of serous membrane is so slight as scarcely to possess any power in preventing a future hernial descent.

The only effectual barrier is afforded by the contraction or diminution of the aperture in the aponeurotic and muscular structures. Such a diminution of the hernial apertures we can sometimes procure. Like the neck of the sac, they have a tendency to become diminished in size, when the descent of the viscera is prevented. In this manner the use of well-adapted trusses promotes the radical cure of hernia. So, also, a cicatrix formed near the hernial aperture, as in the operation of Dessault, which I shall hereafter notice, may, for a time, mechanically prevent protrusion and allow the aperture to contract. The operation of M. Gerdy, in which the opening was filled by an organized plug, appears to have succeeded in the same manner.

The tendency of the hernial apertures to contract, when no obstacle is opposed to it, is greatest in infancy, and progressively diminishes as age advances.

These preliminary remarks being made, it will be necessary now to describe some of the more important measures which have been devised for the purpose of promoting the radical cure of hernia.

a. Means employed for effecting the radical cure of hernia, by promoting closure or destruction of the hernial sac.

α. Excision of the testicle.—Various operations have been performed in which the testicle and the hernial sac were removed by excision. Paulus Ægineta has given the earliest account of this operation. It has since been recommended by Franco, and repeatedly practised by itinerant rupturerers. Dionis relates that one of these operators used to feed his dogs with the testicles which he removed.⁵² In the report made by Poulletier de la Salle, Audry, and Vicq d'Azyr to the Royal Academy of Medicine in 1779, it is stated that, at that time, numerous recruits were found to have had one or both testicles removed by these charlatans.⁵³ The Bishop of St. Papoul ascertained that five

hundred infants in his diocese had been castrated, and that more than two hundred individuals had been thus mutilated at Breslau. Even as late as the year 1796, it appears, from the work of Sabatier, that the operation was occasionally practised in France. Nevertheless, this cruel operation met with vigorous opposition from numerous surgeons, even in the middle ages, and at the early part of the eighteenth century its practice was considered penal by the state, and its professors punished by the magistracy.⁵⁴

β. Incision of the sac.—In this operation the integuments and sac are freely divided, and the cavity is allowed to heal by granulation. It was adopted by Celsus, and was extolled by Lieutaud and Lablanc. Petit practised it with but little success; and Acrel, Sharp, and Pott witnessed the most disastrous results from it. Petit, from his experience of the operation, considered very justly that the incision into a hernial sac, when the hernia was not strangulated, was more serious in its consequences than when strangulation existed.⁵⁵ Mr. Abernethy twice operated in accordance with this plan of treatment. In both instances the life of the patient was seriously endangered.⁵⁶*

γ. Excision, suture, and cauterization of the sac.—In the operation by excision, the sac was laid bare, and a considerable portion throughout its whole length was cut away. The narrow remaining portion of sac was then united by the uninterrupted suture, and the serous bag was contracted in size, so as no longer to allow the viscera to enter it. To this process the name *Royal Suture*, or *Royal Stitch*, was given; as it was supposed to preserve the testicle uninjured and capable of executing its special functions, namely, “of giving subjects to the king.” Strong escharotics, and even

* For a full account of the various methods adopted in all times for the radical cure of hernia the reader is referred to Mr. Lawrence’s very valuable Treatise, in which will be found a full bibliography of the subject, and to the more recent work of M. Thierry.

the actual cautery, have been employed for effecting the destruction of the sac. By these proceedings the testicle was frequently destroyed or deprived of its functions, and sometimes the life of the patient was sacrificed. Bordenave has ably exposed the dangers of these proceedings, and has brought forward numerous instances of their destructive effects.⁵⁷ Amongst the victims of this treatment he enumerates the celebrated De la Condamine.

δ. *Ligature of the sac after incision of the integuments.*—Schmucker exposed the sac by incision through the scrotum, and, after dissecting it carefully away from the integuments and spermatic vessels, tied the neck as closely as possible to the ring, and cut off the remainder below the ligature.⁵⁸ This practice is said to have been successful in two cases. Langenbeck⁵⁹ exposed the sac, and applied a ligature to the neck close to the ring, without detaching the sac further than was necessary for the application of the ligature. This surgeon states, “I have already performed this operation twelve times with the most successful results, and all the patients are capable of the heaviest labour without wearing a truss. . . . The ligature causes adhesive inflammation of the serous surface, and the neck of the sac becomes closed up to the abdomen, like the portion of an artery that has been tied.” This operation, as well as those by suture and caustic, was abandoned in consequence of the pain and danger attendant upon it, and its frequent failure in producing a radical cure. Several other measures, having for their object the production of adhesion of the sac and the consequent obliteration of its cavity, have also been devised and practised, and successively relinquished. For instance, it has been proposed by M. Velpeau⁶⁰ to inject the hernial sac with diluted tincture of iodine, as in hydrocele. This operation was practised on two subjects. The first of these experienced no unfavourable symptoms until the twenty-fifth day after the operation, when he was suddenly seized

with rheumatism and pericarditis, followed by dropsy, which proved fatal in five or six months. In the second case, numerous abscesses formed, and the patient was in considerable danger; and it was only after the lapse of two months that he was able to leave the hospital, the hernia still continuing to descend on the slightest exertion. M. Velpeau has also attempted the cure of hernia by scarifying the neck of the sac by subcutaneous incision. The patient was treated for double inguinal hernia; but, when the bandages were removed at the expiration of a month, both herniæ reappeared.

ε. *Acupuncture*.—An attempt has recently been made by M. Bonnet of Lyons to procure adhesion of the sac by the introduction of pins, which were allowed to remain in the sac until adhesive inflammation was excited.⁶¹ The pins were removed from the sixth to the twelfth day; and, as soon as the sensibility of the parts permitted, a compressing bandage was applied. As this process was not sufficient, a second row of pins was inserted, so as to multiply the points of adhesion; and these pins were allowed to remain in until the ulceration

Fig. 8.



of the skin was complete, and the compression was exercised upon the cellular tissue itself (fig. 8). M. Bonnet subsequently adopted some further modification of his plan; and in his memoir, published in the *Gazette Médicale*, brings forward nine cases in which the operation was performed. Four of these cases were cured; five were unsuccessful, two of which proved fatal.

These results of MM. Velpeau and Bonnet's respective modes of treatment are such as to render it almost need-

less to state, that a repetition of them would be altogether unjustifiable ; indeed, it may without hesitation be asserted, that few, if any, English surgeons would have ever ventured on such hazardous experiments.

ζ. *Insertion of goldbeaters' skin in the sac.*—M. Belmas⁶² has instituted some experiments, from which he has ascertained, that, where a small bladder of goldbeaters' skin, inflated with air, was introduced into the peritoneal cavity of a dog, the spot to which the foreign body had applied itself was indicated, after the lapse of three months, by the presence of adhesion, whilst the general peritoneal cavity remained free from any other trace of inflammation, the foreign body being no longer distinguishable.

Having thus discovered an animal substance that might be introduced into a serous cavity with the effect of exciting a mild form of adhesive inflammation, purely local in its character, he considered that it might be applied to the cure of hernia. He operated on several dogs afflicted with this disease without any unfavourable consequence, and was induced to apply the principle to the human subject. Portions of goldbeaters' skin were conveyed into the mouth of the sac by means of a trochar and canula ; which, entering the lower part of the sac, were carried upwards, until they had passed the neck, and were then brought out through the integuments just above the external ring. By means of an apparatus connected with the canula, a portion of inflated goldbeaters' skin was drawn within the sac, and allowed to remain there. Of four cases in which the operation was performed, one only was perfectly successful, without the occurrence of any serious accident. The second proved fatal. The third was cured ; but the patient was so unruly, that M. Belmas was obliged to withdraw the foreign body a few hours after its introduction. The fourth died from phlegmonous erysipelas.

In consequence of the severity and not very favourable results of these operations, M. Belmas was subsequently in-

duced to adopt the method of merely puncturing the lower part of the sac with a trochar and canula, and then introducing through the latter one or more portions of gold-beaters' skin, supported on sticks of dried and hardened gelatin. A bandage or truss was worn for a considerable period after the operation, or until the adhesions had become firm. The result of ten operations is thus stated. "Two out of the number left the neighbourhood after the operation, but have represented themselves as cured. In three other cases the success was placed beyond a doubt. In three more an obliteration was obtained of the neck of the sac, but the subsequent necessary compression at the ring having been abandoned too early, a fresh protrusion of the obliterated point took place: the truss has been reapplied, and the return of the ring to its normal condition is such that we anticipate a decided cure. The two remaining individuals were obliged to lay aside their bandages at an early period in consequence of the inconvenience they produced, and in them the herniæ have reappeared. They are anxious to undergo a fresh operation."

The preceding operations, having for their object the destruction or closure of the hernial sac, have undoubtedly succeeded in attaining this object; but it is necessary to repeat, that the obliteration of the sac affords but a feeble barrier to a fresh hernial descent, and only a very slight advance is thereby made towards a radical cure of the disease.

It cannot be denied that in some instances a radical cure was obtained. The plastic effusions and cicatrization in the neighbourhood of the ring, incidental to some of the proceedings, may have had the effect of resisting the protrusion long enough for the hernial apertures to become contracted; but such an effect was rare, and the attainment of a contraction of the hernial apertures seems to have been an object in the estimation of the operators quite subordinate to the closure of the sac.

b. Means calculated to promote the contraction or closure of the hernial apertures.

The means which have been found most effectual are trusses, ligature of the sac and its envelopes, and the cutaneous plug.

a. Trusses. — By the use of well-adapted compresses retained by bandages of various kinds, hernia is often permanently cured. Nearly all umbilical and most inguinal herniæ of infancy may be cured by methodical compression, as well as some herniæ of youth and manhood; but those of old age rarely, if ever, admit of being permanently cured by these means.

The mode in which trusses effect a radical cure is not by exciting adhesion in the parts which they compress, nor by inducing contraction, or even closure, of the neck of the sac,—an effect which they have a well-known tendency to produce; but they simply operate by preventing the hernial descent for a sufficient length of time to allow of nature to effect the contraction of the aperture in the aponeurotic and muscular portions of the walls. Our object, then, in attempting the radical cure of hernia by trusses, should be to secure perfect retention of the viscera, without exercising injurious pressure. If too high a degree of pressure be employed, inflammation or irritation may be produced, and may require the suspension of the treatment. From undue pressure operating for a long time, but less powerfully, the walls of the abdomen sometimes become atrophied and their strength diminished. When the pressure is too much concentrated, by the use of pads of small size and great convexity, in large inguinal herniæ, which have considerably dilated the inguinal canal, the aponeurotic structures of the canal are thereby stretched, and, in time, may become actually elongated, and consequently weakened, by the pressure.

In attempting, then, to produce a radical cure by the

use of trusses, it is necessary to guard against such degrees and modes of pressure as would excite irritation in the parts compressed, or produce either atrophy or elongation of aponeurosis and muscle. The means best calculated for promoting perfect and salutary retention of the viscera, are such as are generally most efficient in the palliative treatment of hernia, and under this head their general principles of construction have already been considered. The modifications adapted to the particular varieties of hernia will be described when each variety comes under consideration. As perfect retention of the hernia is an essential condition for its radical cure, it is necessary that the truss should be worn without intermission.⁶³

β. Ligature of the sac and its envelopes.—Celsus attempted the cure of umbilical hernia by applying a ligature round the integuments and sac after the viscera had been returned into the abdomen. Thevenin practised this operation with success, and Saviard⁶⁴ successfully treated two female children by this method. Desault frequently practised the operation.

In the Parisian Chirurgical Journal⁶⁵ are recorded nine cases in which he successfully performed the operation; and in the same Journal it is stated, in reference to the treatment of umbilical hernia by ligature, that “its effect is certain and quick, and that it has invariably succeeded in thirty cases that have been operated on during the last eighteen months at the Hôtel Dieu.” Sabatier states that many of these cases were subsequently brought to the hospital on account of other diseases, and it was ascertained that the cure was permanent. Desault is said to have been uniformly successful in this operation when it was performed on infants of an early age; but, in a girl nine years old, the swelling in six months after the operation had regained its original magnitude. In several other instances, where the operation was performed at so late a period, the result has been the same. Scarpa, from

his experience of the operation, formed a less favourable opinion of its safety; and he states that it is incapable of producing a truly radical cure without the assistance of compression continued for several months after the wound is cicatrized. Sir A. Cooper condemns it as painful and dangerous, and it is asserted by Richerand⁶⁶ that the complaint returned in many of the cases supposed to have been radically cured by Desault.

In favour of this practice, however, the experience of M. Thierry⁶⁷ has lately been adduced. It is stated by this surgeon, that his father operated in thirteen cases, and that he himself had operated in five, without encountering any serious inconvenience, and without loss of life in any instance. The operation was performed after the manner of Desault, and the patients were all under three years of age.

On reviewing the evidence adduced in reference to this operation, it must be admitted, that, although the cure in all cases was not permanent, yet in some instances the operation by ligature, as practised by Desault, was followed by the permanent cure of umbilical hernia; or, in other words, that the cicatrix consequent upon the operation sometimes possessed sufficient power of resistance to prevent the return of the hernia until spontaneous contraction of the aperture occurred. Hence the operation by ligature may be regarded as one of the means whereby a radical cure may sometimes be effected; but when the pain which it excites, and the loss of life which in some instances it has occasioned, are considered, its adoption must appear to any unprejudiced surgeon as being no longer justifiable, particularly since almost all cases of umbilical herniæ in infants admit of radical cure from the use of a small hemisphere of wood or ivory retained in apposition with the umbilicus by a piece of leather spread with adhesive plaster, and supported by a broad belt of linen.

γ. *The cutaneous plug*.—Various attempts have been made

to promote a permanent cure of hernia by introducing at the hernial aperture a plug of organized matter. Two ways have been adopted for this purpose which merit further trial : one, first devised and practised by Dr. Jameson of Baltimore, consists in partially detaching a piece of integument from the neighbourhood of the ring, and introducing it into the aperture ; the other, first suggested and practised by M. Gerdy, and followed by others, has for its object to draw the loose scrotal integuments into the inguinal canal, and to excite the adhesive inflammation between the invaginated integuments and the wall of the canal.

A young lady, on whom the operation for strangulated femoral hernia had been performed by Dr. Jameson,⁶⁸ was greatly distressed by a return of the swelling ; and being determined to get rid of it by any means, however hazardous, submitted to the following operation, which was performed by Dr. Jameson, and which he thus describes : "The hair carefully shaved off the part, I made an incision through the skin and fatty structure down to the fascia of the thigh, a little to one side of the centre of the femoral aperture and a little obliquely upwards ; and a second incision beside it, by which I cut loose a lancet-shaped piece of integument, the widest part of which was fully three-fourths of an inch wide and two inches in length. Its largest diameter upwards and downwards, and most of the tongue-like flap below the aperture ; wide end down, and cut loose ; the upper left attached to the skin over Poupart's ligament, by which connexion this flap was to be sustained. The fascia being now cut and the hernial tumour returned, the thick end of my flap was forced into the femoral aperture. Then the skin on either side was drawn over the flesh, and united by three or four sutures." "Vomiting and restlessness were troublesome for a day or two, and the outer skin did not heal in its whole extent by the first intention. Still it healed in considerable part, and the flap contracted into a hard knob over the aperture ; and

thus was it closed, so as to prevent return, to the best of my knowledge."

M. Gerdy⁶⁹ has attempted to close the hernial aperture by carrying a fold of the scrotal integuments upwards into the inguinal canal, and retaining them invaginated in that situation by one or more sutures. The principle of the operation was probably suggested by the result of two cases recorded by Arnaud, wherein, during the reduction of an inguinal hernia, a fold of skin was carried up and drawn into the ring; adhesion took place, and the cure was permanent. The instrument employed by M. Gerdy in this operation is a curved needle fixed in a handle and concealed in a sheath, along which it may be moved. The needle is pierced near its point by two apertures, and along its convexity between the two openings is situated a groove deep enough to lodge a double ligature of waxed silk. The operation is performed in the following manner: The patient being placed in the horizontal position, the surgeon, having ascertained that the hernia is perfectly reduced, pushes with the forefinger of the left hand a blind pouch of integuments upwards into the inguinal canal, anterior both to the cord and the hernial sac (fig. 9). The point of the needle, armed with the ligature, is then guided along the finger to the bottom of the pouch, and by depressing the handle is brought out through the anterior wall of the inguinal canal. One end of the ligature is then laid hold of by an assistant, and, the point of the needle being withdrawn into the

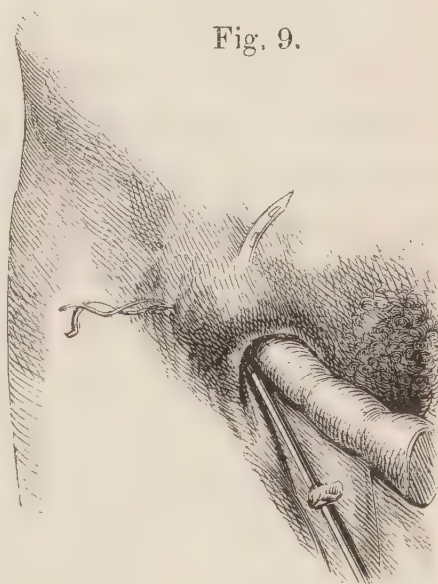


Fig. 9.

Gerdy's operation for obliterating the hernial aperture by the cutaneous plug.—After Bourguery.

pouch, a second similar perforation is effected at a few lines' distance from the previous puncture. In this manner both ends of the ligature are carried from the inside of the pouch or invagination through the inverted skin, the tendon of the external oblique, and the integuments of the inguinal region, where they are tied over a piece of bougie. One or more of these stitches are made, according to the size of the opening. Caustic ammonia is then freely applied to the internal surface of the pouch, and the operation is concluded by covering the parts with a slight compress spread with common cerate. About the third day a copious suppuration is established, and at this period the sutures are removed; but this removal of the sutures should depend only on circumstances which appear to warrant it. After the operation, adhesion gradually takes place between the invaginated integument and the sides of the inguinal canal; whilst at the same time the pouch itself becomes obliterated by the process of granulation set up by the caustic. Within the fifteenth or twentieth day the suppuration ceases, and the dilated inguinal canal is found completely blocked up by a strong thick plug, the presence of which is indicated by an external projection, which may be distinctly felt beneath the skin and tendon. This gradually disappears, until no trace of the operation remains except a trifling scar at the entrance of the pouch, and a slight elevation and shortening of the scrotum on that side. The recumbent posture should be maintained for about a month after the performance of the operation, and a truss worn for three or four months after the patient leaves the bed.

Mr. Bransby Cooper, in performing M. Gerdy's operation, pushed a portion of scrotal integument before the forefinger of his left hand, through the external ring, into the inguinal canal as high as he could pass it, and, upon the finger, introduced a director. A long needle fixed in a wooden handle, and having the eye near its point armed with a double silk ligature, was then carried along the director to

the very extremity of the invaginated skin, and was pushed through the tendon of the external oblique muscle and the skin, and made to come out an inch and a half above Poupart's ligament: one end of the silk was then retained by an assistant, and the needle drawn back again into the inguinal canal along with the other end; when it was again pushed through the abdominal parietes, in a similar manner as before, about four lines distant from the other end of the thread, including necessarily so much of the skin between the two silks, which were now tied over a piece of bougie.⁷⁰

M. Signorini⁷¹ has modified M. Gerdy's operation by using three hare-lip pins, and the twisted suture, moderately tight to fix the invagination. The pins and threads were removed on the seventh day.

Of sixty-two patients who have submitted to the operation of M. Gerdy, four have died: one of acute pleurisy, supposed to have been produced by the use of cold applications for the relief of an inflammatory state of the inguinal region; and another from organic disease, which existed previously to the operation. Time alone can prove how many of the sixty-two operations have produced a radical cure. It is true, that many of the patients after a considerable lapse of time had not experienced any return of the hernia; and in others, although there still existed some protrusion, yet the size of the canal was so much diminished as to allow of the hernia being easily retained by a truss.

On reviewing the sixty-two cases collected by M. Thierry, it is evident that the operation of M. Gerdy is capable in many instances of producing a radical cure of hernia. But this effect does not result from the barrier covered by the cutaneous plug being permanent. The resistance afforded by the invaginated portion of skin is only temporary, for M. Gerdy has ascertained that after some time it becomes atrophied. Nevertheless it constitutes a barrier, aided probably

by plastic effusion, for a sufficient length of time to allow the hernial aperture in some cases to contract so completely as to prevent the future descent of the hernia; and in others to such a degree that the hernia can be readily retained by a truss. Such was the result of Mr. Bransby Cooper's case.

It is interesting to observe that in none of the cases did peritonitis occur; and, from observations made by M. Gerdy on the dead body, it appears that the sac almost invariably remains behind the invaginated portion of skin, entirely out of reach of the needle. This fact is also verified by M. Thierry.⁷² Hemorrhage occurred only in one instance.

It is also shewn that the operation is frequently attended with serious accidents, and may sometimes prove destructive to life. As before stated, of the sixty-two patients on whom the operation was performed four died, and several experienced suppuration of the abdominal walls.

Under these circumstances, the operation can only be considered justifiable when well-directed attempts at palliative treatment have failed, and the inconvenience and suffering occasioned by the hernia are so great as to interfere seriously with the patient's avocations, comfort, or health.

CHAPTER X.

TREATMENT OF IRREDUCIBLE HERNIA.

IN the treatment of irreducible hernia one or more of the following objects are principally aimed at; namely, the conversion of the irreducible into the reducible condition,—the prevention of the increase of the hernia,—and the relief of the evils resulting from it.

1st. *The conversion of the irreducible into the reducible condition.*—*a.* When a hernia has become irreducible from hypertrophy, we may sometimes so far succeed in reducing its bulk as to render it capable of being returned into the abdomen. The principal means by which this may be accomplished are recumbency, the general and local abstraction of blood, purgatives, low diet, and the application of cold. In deciding upon the propriety of attempting to render the hernia reducible, and in the selection and combination of the appropriate remedies, as well as in determining the extent to which they may individually be carried, there is wide scope for the exercise of the judgment of the surgeon. He will not, for instance, even attempt the restoration of the hernia to the reducible state when the protrusion is of large dimensions, and has so long existed that the abdominal walls have become adapted to their diminished contents. If he were in such a case to succeed in rendering the hernia reducible, its replacement would be equivalent to the introduction of a foreign body into the abdomen, which would irritate and might destroy.⁷³ In herniæ, however, of more recent date, of more moderate size, and which are irreducible from hypertrophy,

attempts at reduction may be made ; but, to effect this, it will be necessary first to direct attention to the most likely treatment for procuring a diminution of their size. The means which have been already mentioned as calculated to accomplish this object, act for the most part by powerfully rousing the absorbent function. Of these, the free and repeated abstraction of blood may be regarded as one of the most powerful agents, but, at the same time, one which must not be indiscriminately employed. In persons of feeble and unhealthy constitution it is inadmissible ; in the robust it may be practised freely and repeatedly ; whilst in the intermediate class the surgeon must weigh well the circumstances of the individual case in determining the extent to which sanguineous depletion may be carried.

The purgatives best suited to our present object are such as cause free secretion from the various chylopoietic organs. None perhaps answer better than a few grains of compound extract of colocynth and blue pill taken at bed-time, with saline purgatives on the following morning. These medicines should be frequently repeated.

The local influence of cold powerfully assists our treatment. One mode in which it operates, as Sir A. Cooper has suggested, is by constricting the tissues external to the hernia, which consequently produce an uniform and gentle compression of the protruded parts. To secure the beneficial effects of cold, its influence should be long continued ; it is therefore important that the degree of cold to which the living parts are long exposed should not be intense. Ice has occasionally been employed, and in the treatment of strangulated hernia, when it appears desirable to produce a powerful and sudden reduction of temperature, it is often a valuable application, provided the effects upon the parts to which it is applied be carefully watched ; but in the condition of hernia now under consideration, in which a moderate and prolonged, rather than an intense and sudden influence of cold is desired,

the employment of ice is inadmissible. Dr. Macfarlane⁷⁴ witnessed gangrene of the integuments after ice had been applied to a hernia twelve hours. A safer and yet efficient reduction of temperature may be produced by evaporation. For this purpose, cloths wet with water, or with spirit and water, may be applied to the hernia; care being taken that evaporation is not counteracted by an accumulation of bed-clothes.

Compression, judiciously employed, is calculated to effect a diminution of the size of hypertrophied omental herniæ. The pressure may be safely and conveniently exercised through the medium of a compress filled with air, as recommended by Mr. Arnott.

The treatment of irreducible hernia, which I have briefly noticed, has long been practised with success. Fabricius Hildanus reduced an old hernia, which had long been irreducible, by confining his patient to bed for six months and restraining him to a rigid system of diet. Arnaud successfully combined purgatives and abstractions of blood with rigid diet and recumbency. Mr. Hey, in his *Practical Observations*, has related several cases which were treated upon the same principles; and many examples of similar success, after the adoption of this treatment for periods varying from a few days to several months, have been witnessed in our hospitals.

b. Herniæ, irreducible from adhesions, may occasionally, yet very rarely, be rendered reducible. This change of condition is effected in two ways: first, by gradual elongation of the adhesions; secondly, by inversion of the sac.⁷⁵ The first is only likely to occur when the adhesions exist between the hernia and the base of the sac; the second when the hernia is small, and the filamentous tissue external to the sac is healthy and extensible.

For effecting these changes in the adhesions or in the sac, we employ recumbency and pressure. Without the former, the most judicious compression would not be likely to suc-

ceed ; and it is only in herniæ of small or moderate size that we can entertain any reasonable hope of success. The compression is exercised through the medium of a truss with a hollow pad. After the patient has been recumbent some time, and the hernia is rendered as small as possible by position and pressure with the hand, a plaster cast of the tumour should be taken, which will serve as an accurate guide in determining the form and degree of concavity of the pad of the truss. After the instrument has been worn a few days, the concavity of the pad may be gradually diminished by the addition of successive layers of soft leather, until its surface is perfectly plane. Afterwards a pad moderately convex may be employed. It is only in a small proportion of irreducible enteroceles that the requisite degree of pressure can be borne. I have, however, seen instances which have been attended with perfect success. I had lately a female patient in the Leeds Infirmary affected with an irreducible femoral enterocele about the size of a walnut. In five weeks it could be so far replaced that no external tumour remained; and the patient left the hospital wearing a common femoral spring-truss with a convex pad. That the hernia was an enterocele I have no doubt, as it was frequently the seat of the characteristic gurgling noises of intestinal hernia.

An epiplocele bears pressure better than an enterocele, or rather the patient suffers less pain from the pressure; but, even in the former, the pressure intended to effect its gradual replacement must be employed with great caution. From the injudicious employment of trusses the omentum has sometimes become gangrenous,⁷⁶ and serious peritonitis has also occurred.⁷⁷

Herniæ of the bladder and of the cæcum, irreducible from possessing their natural filamentous connexions, may in their earliest stages be gradually replaced under a judicious system of pressure by means of trusses with a hollow pad, combined with strict recumbency. By these means the filamentous

connexions may be made to yield, and the hernia gradually to diminish, until at length the protrusion, which had formerly been irreducible, may be returned within the abdomen, and there retained by an ordinary truss with a convex pad.

2nd. *The prevention of the increase of the hernia.* — When the attempt to render the hernia reducible is considered undesirable or impracticable, the treatment should be directed towards preventing its increase. This object is more or less perfectly attained, in cases of hernia of small or moderate size, by the use of a common spring-truss with a hollow pad. A convenient pad for this purpose is formed of a circular or oval plate of metal, in which an opening is cut of the size and form of the base of the hernia; over this aperture is loosely spread a layer of soft leather, so as to constitute a pouch capable of containing, but at the same time of gently supporting, the hernia. If the protrusion is of very large dimensions, it must be supported by a suspensory bandage laced in front. Besides this local treatment, it is incumbent on the practitioner to forbid all violent muscular efforts; and if any constitutional symptoms should be present likely to affect the muscles of respiration, abdominal as well as thoracic, such as cough, which frequently exists with old hernia, and, if not relieved, invariably aggravates it, every endeavour should be made to alleviate it as quickly as possible.

3rd. *The relief of the symptoms resulting from the hernia.* — The means calculated to fulfil the former indication are those which are most effectual in alleviating the principal dragging sensations, and the distressing sense of weight, which frequently attend large herniæ. The tendency to constipation must be obviated by laxative medicines and clysters.

a. *Treatment of irreducible hernia in a state of inflammation.* — Allusion has already been made (page 50, *et seq.*) to the importance of distinguishing between an inflamed irreducible hernia and hernia in a state of strangulation, as well

as to the possibility of the former state being ultimately complicated with the latter. These facts must be steadily borne in mind during the whole progress of our treatment of this obscure form of the disease.

Inflammation affecting an irreducible hernia must be combated chiefly by such local and general abstractions of blood as are suited to the strength of the patient. This remedial measure may be aided by evaporating lotions and clysters. Purgatives can do no good until the intensity of the inflammation is subdued, after which they may be employed with advantage.

If the symptoms of obstruction should have supervened, and do not subside under this treatment, it may be suspected that the protruded parts, from being swollen, suffer constriction. Under these circumstances it is necessary to divide the stricture, and it is of very great importance that the operation should be performed, whenever it is practicable, without opening the sac.

b. Treatment of irreducible hernia when obstructed.—In reference to this part of the subject, the reader's attention is directed to the observations already made under the head of obstructed irreducible hernia. (Page 51, *et seq.*)

CHAPTER XI.

TREATMENT OF STRANGULATED HERNIA.

THE objects to be attained in the treatment of herniæ in a state of strangulation are the release of the protruded parts from stricture, and their replacement within the abdomen, provided they are in a suitable condition.

These objects are usually sought to be accomplished either by manual pressure, to which proceeding the name of *Taxis* is applied, or by *operation* with the knife.

I. *The Taxis.*

The *Taxis* essentially consists in the methodical manipulation of herniæ, for the purpose of effecting their reduction.

In considering this subject, it is necessary to direct attention not merely to the mechanical process whereby the replacement of the hernia is attempted, but also to the circumstances which forbid, or which sanction, its employment; to the accidents which sometimes result from its use; and to the auxiliary expedients for securing its safety and efficiency.

a. Cautions necessary in using the taxis.—It must ever be borne in mind that the *taxis* is essentially a process of violence, or, in other words, that the obstacle to the return of the hernia is to be overcome by force, more or less powerfully exerted. Duly impressed with this fact, and fully appreciating the delicate structure and important functions of the protruded parts, no temptation can at any time warrant the use of greater force than is consistent with the preservation of those parts in a functional condition, and with

the safety of the patient. Nor ought the surgeon in any case to venture on any attempt at reduction by manual pressure when symptoms of increased sensitiveness, inflammation, or gangrene are present.

The following observations will suffice to shew the injuries which are sometimes inflicted by the taxis, as well as to prove that although reduction of the hernia may be effected, it does not necessarily follow that the patient is thereby placed in a state of safety.

A man, aged 39, was admitted into the Glasgow Infirmary, having been twenty years the subject of a reducible hernia which had been strangulated ten hours. During the greater part of this time a surgeon had made powerful and continued efforts to return the displaced parts, and, on his admission into the hospital, the taxis was again rather forcibly employed. When the patient was seen by Dr. Macfarlane,⁷⁸ he considered it improper to make any further attempts at reduction. The scrotum was much swollen and discoloured. When the sac was opened, not less than a pound and a half of dark-coloured blood escaped, a considerable quantity of which was pressed from the depending part of the scrotum. The hernia consisted of a large portion of omentum, which was covered with coagulated blood, and of nearly two feet of intestine. The omentum was bruised and lacerated, and the protruded gut was almost wholly separated from the mesentery. It contained several rents, which passed in a longitudinal direction; and into each of these openings two or three fingers could be introduced.

Mr. T. W. King,⁷⁹ in the paper on hernia already referred to, states that he possesses the unpublished records of forty fatal cases of strangulated hernia. Eight of these proved fatal after reduction by the taxis; namely, six from rupture of the intestines, one from peritonitis, and one from having been reduced in mass.

Even in cases which recover, it is not uncommon to find pe-

ritonitis, of such intensity as to endanger life, following reduction by the taxis.

The return of the hernia in mass, whilst strictured by the neck of the sac, is an accident of a most formidable character, which occasionally, although rarely, results from manual pressure. This accident may occur even under the employment of such a degree of pressure as the surgeon was justified in exercising. The phenomena attendant upon reduction in mass, and the treatment which it requires, will be considered hereafter.

But mechanical injury is not the only evil that may be laid to the charge of the taxis. The loss of time attendant upon its use is sometimes productive of irreparable mischief. It is then incumbent upon the surgeon to consider well whether the probability of its success in any particular case is to be placed in competition with the certain evils resulting from loss of time.

Having held out these cautions against injurious pressure and unnecessary delay, it becomes necessary next to proceed to notice those circumstances in the hernia itself which sometimes forbid the employment of manual pressure.

If the omentum or intestine be gangrenous, their replacement is improper, even if it were practicable. We have strong presumptive evidence that the protruded parts are gangrenous, if there be inflammation, œdema, or emphysema of the parts covering the hernia, or the patient be in a state of collapse. At any rate these circumstances absolutely forbid the use of the taxis.

An inflamed state of the hernia renders the taxis improper. It may be presumed that the protruded parts are inflamed when the tumour is painful on pressure, and of increased temperature, more especially if a pyrexial condition also exists. By the abstraction of blood and the use of cold applications, inflammation in its slightest degrees and early stage may sometimes be so far relieved as to allow of the taxis being

employed; but in this case the utmost gentleness must be observed, and on no account must the process be long continued.

A morbidly sensitive condition of the hernia, even without local heat or general pyrexia, should deter us from the immediate use of the taxis. Such a condition is frequently the precursor of inflammation, and the force employed in the taxis would be calculated to accelerate its occurrence. Manipulation should, therefore, never be practised until the morbid sensibility has been overcome by the use of some of the adjuvants of the taxis.

Such then are the circumstances which forbid the employment of the taxis. When, however, there is ground for assuming that the hernia is neither gangrenous nor inflamed, and when the sensibility of the tumour is so moderate that manual pressure can be easily borne, gentle and well-directed efforts at reduction by manual pressure may be made.

In thus employing the taxis and its adjuvants, the strictest regard for the economy of time must be observed; for, of all the causes which determine the fatal issue of strangulated hernia, delay is the most frequent and destructive.

b. Mode of performing the taxis.—In considering this part of the subject, attention must be paid to the position of the patient and surgeon, and to the act of manipulation. The bladder and rectum having been previously evacuated, the patient should be laid on his back, and placed, when circumstances permit, near the edge of the bed, so that the surgeon may take his position close to the right side of the patient, and be able to assume an attitude which he can maintain for a considerable time without fatigue. The latter object is best attained by kneeling near the bed, or by sitting in a low chair. The patient must next be placed in such a position as will best secure a relaxed state of the muscles and aponeuroses of the abdomen and thigh.

The objects of the surgeon in relaxing these structures are

to promote the return of the hernia, and to secure the more perfect manipulation of the tumour. Whilst the abdominal muscles are contracted, they powerfully resist attempts at reduction, refusing, as it were, to admit the additional portion of the viscera into the abdomen; and whilst Poupart's ligament and the femoral aponeurosis are in a state of tension in small herniæ, especially in those of the femoral species, they frequently form a powerful impediment to the free manipulation of the tumour. The object in this instance in relaxing the muscles is not to diminish the intensity of the stricture, but to relieve the state of tension in which the walls of the abdomen may be; for in most instances the boundaries of the constricting aperture are formed by aponeurotic and osseous structures, and consequently this aperture is incapable of being altered in size by a relaxed or contracted state of the muscles. In this respect, however, the practitioner rather loses than gains advantage in relaxing the abdominal muscles, for it is much easier to push a substance through an opening of a given size in a tense, than in a relaxed, membrane. M. Lisfranc recommends that the walls of the abdomen should be placed in a state of moderate tension, which, he says, facilitates reduction. I have on several occasions succeeded in reducing herniæ by placing the aponeuroses in a state of tension, after I had failed in my attempts whilst the muscles were relaxed. But, as a general rule, it is better in the first instance to secure the advantages which have been described as resulting from relaxation of the muscles; and afterwards, our attempts having failed, the taxis may be repeated whilst the parts are moderately tense.

To accomplish this relaxation of the muscles and aponeuroses, the patient should be laid on his back, with the pelvis and shoulders a little elevated by pillows, so that the back may sink into the hollow between them, whilst the thighs are bent nearly to a right angle with the trunk, and approximated towards each other, and the feet resting flat upon the bed.

If the tumour be small, the surgeon surrounds it with the tips of the fingers of the right hand, distributing them over its surface so as to produce a general or nearly uniform pressure; but, if it be large, he grasps the tumour with the whole hand and fingers. Whilst the right hand is thus occupied in gently and steadily compressing the body of the tumour, the thumb and one or two fingers of the left hand are applied to its neck, and have a somewhat complicated duty to perform, being employed in preventing the tumour from being pushed or doubled over the edge of the stricture by the pressure of the right hand; in pulling down the upper part of the tumour, so as to render the sac and the tendinous aperture tense and smooth; and sometimes in moving it from side to side, so as to disengage the constricted parts.

The general pressure exerted upon the tumour by the right hand has, for its first object, the diminution of the bulk of the protruded organs, preparatory to their being pushed through the constricting part. This procedure is analogous to that which is adopted in the reduction of a strictured paraphymosis, or of a prolapse of the rectum. By gentle, uniform, and prolonged compression, the bulk of the hernial tumour may frequently be diminished, the gorged vessels of the protruded parts are partially emptied of their blood, and the gaseous or liquid contents of the intestine pushed back into that portion of it which is within the abdomen—an event which is generally the prelude to its speedy return. If the resistance afforded by the stricture be not already overcome, the pressure may now be more steadily directed towards the point of resistance; the surgeon always bearing in mind that success is more likely to attend gentle, well-directed efforts, gradually increased, than sudden violence. In very large herniæ, both hands are required for effectually grasping the tumour, so as to subject the whole of it to pressure; in such cases an assistant must be employed in supporting and manipulating the neck of the

tumour. When the bed upon which the patient is laid is too soft to afford sufficient resistance, a firmer mattress or couch must be substituted for it.

The pressure should generally be continued from five to ten or fifteen minutes; and in large herniæ, in which the strangulation is seldom acute, it may be continued for a much longer period. Mr. M'Leod, of Glasgow, successfully prolonged the compression for one or two hours; but such practice can only be applicable to those cases which have been styled *incarcerated*, in which the stricture merely opposes resistance to the passage of the intestinal contents without disturbing the vascular condition of the protruded parts. As a general rule, then, from five minutes to a quarter of an hour may be regarded as a proper period for the duration of the taxis. Should, however, this attempt at reduction prove unsuccessful, the remedies which are likely to contribute to this result may be used. The patient may be bled to faintness, and the state of general relaxation may be further promoted by the hot bath, and the taxis repeated whilst the patient is in the bath. If the hernia still resist these attempts, and the symptoms are not urgent, a little further time may be devoted to the application of cold, and to the use of the flexible tube, as recommended by Dr. O'Beirne; after which the taxis may be once more repeated, and, if not soon successful, the operation should be performed. In our attempts at manual reduction, the direction of the pressure should be guided by the course of the canal through which the hernia has descended. This necessarily varies in the different species of hernia. If these attempts at reduction fail, it is sometimes a useful expedient to request the patient to attempt the reduction himself. He then assumes the particular attitude, and directs his pressure in the precise direction, which from long experience he has found most favourable for the replacement of the hernia under or-

dinary circumstances. From this observation the surgeon may sometimes derive a valuable hint.

A deception occasionally arises in the employment of the taxis, in consequence of the tumour becoming diminished in size, from the serum which was contained in the sac having been pushed within the abdomen, whilst the viscera remain protruded. In this case the tumour soon regains its former size and tension, and the symptoms of strangulation persist. The surgeon may also be led into error by supposing the hernia to have been reduced, when a portion only of the protruded parts have been replaced.

In the event of the taxis being successful in reducing the hernial mass, assiduous care and attention are still required in order to detect and meet by proper treatment the earliest indications of inflammation of the reduced parts, or of the general peritoneal surfaces, which may and often do occur, and which, if unchecked, soon lead to a fatal termination. Should the usual indications of inflammation occur, they must be promptly met by abstraction of blood, generally by the lancet and locally by leeches, as freely as the powers of the patient will allow, and the severity of the symptoms warrant; and, in addition to them, the abdomen should be well fomented by flannels warmed with hot water and wrung dry, followed by poultices and blisters. Purgatives and even laxatives should, on the other hand, be withheld until the inflammatory symptoms are subdued; the action of the bowels being merely solicited by small emollient clysters.

c. Adjuvants of the taxis.—It is frequently necessary to employ various means for increasing the safety of the taxis, or promoting its efficiency.

These auxiliary measures operate in various ways:—by relaxing the abdominal muscles still further than could be done by position,—by unloading the viscera of the abdomen,—by diminishing the sensibility of the hernia,—or by reducing the bulk of the protruded parts.

α. Bloodletting. — One of the most powerful adjuvants of the taxis is venesection.

In order to exert its full influence, the blood should be drawn in a free stream until faintness is produced. In this condition the abdominal muscles are relaxed, and offer less resistance, whilst the tumour is softer and less painful to the touch. If inflammation have commenced, it is thereby mitigated; and, even if the taxis should not ultimately succeed, the patient is placed in a more favourable condition for the operation. Mr. Pott was so strongly impressed with the utility of venesection, in promoting the success of the taxis, as to maintain that it ought never to be omitted unless particular circumstances in the constitution should forbid it.

Sanctioned by the authority of Pott, Richter, Callisen, Cooper, Hey, and Lawrence, this practice has been very generally adopted throughout Europe; but its most strenuous advocates would by no means urge its indiscriminate employment. In the young and the plethoric, more especially when the strangulation is intense, and in its early stage, venesection may be practised with freedom; but in the feeble or the aged, or in the advanced stages of strangulation when gangrene and collapse have occurred, it is inadmissible. The general condition of the patient, the state of tumour, and the character of the pulse, are the points to be regarded in forming our decision. A small, rapid, thready pulse should not forbid the abstraction of blood; but the surgeon must carefully distinguish this contracted pulse, which, from possessing considerable power of resistance, whilst its volume is diminished, has been named *wiry*, from the rapid, feeble, and scarcely perceptible pulse, vanishing under slight pressure of the finger, which is the precursor of dissolution. He must also distinguish the state of coldness of the extremities, accompanied with heat and pain in the tumour and in the abdomen, which often attends inflammation of the bowels, whether

arising from hernia or other causes, from the clammy moisture and deadly coldness of the limbs, and the scarcely less moist and cold condition of the trunk, which betoken the approach of death.

β. Hot bath.—The hot bath, when employed so as to produce a state approaching to fainting, possesses considerable power in aiding the taxis. Herniæ are frequently reduced in the bath, after they have resisted many previous attempts. The bath acts favourably by relaxing the abdominal muscles, and by diminishing the sensibility of the tumour. The temperature should be 100° Fahrenheit at the commencement, and be very gradually raised to 108° or 110°, and kept at this until faintness is induced, when the taxis may again be attempted. The importance of the hot bath is such that it ought to be generally employed in conjunction with the taxis where there is difficulty in returning the hernia, but its advantages are not so great as to compensate for the evils which may arise from any considerable delay in procuring it.

Desault⁸⁰ made extensive use of the hot bath in the treatment of strangulated hernia, in combination with emollient poultices. The former is still held in general repute, whilst the emollient poultices have long been laid aside as useless, if not prejudicial.

γ. Cold applications.—Cold, locally applied, has long been known as a powerful auxiliary of the taxis. Through its agency the envelopes of the hernia become constricted and exert upon it a gentle and uniform compression whereby the congested vessels of the protruded parts are unloaded, and the gaseous contents of the intestine are condensed so as to produce a diminution of the general bulk of the tumour. Cold also moderates the inflammation that may exist, and diminishes the morbid sensibility of the parts.

The most efficient mode of employing cold consists in the application of ice; but great caution is requisite in its prolonged employment, more especially in the aged and feeble.

Mr. Cline⁸¹ witnessed gangrene of the integuments after ice had been applied thirty-six hours, and Dr. Macfarlane⁸² after twelve hours. Dr. Trusen of Posen recommends the administration of ice in small lumps internally by clysters, repeated every five or ten minutes. He considers this a powerful remedy, not only in promoting the return of the hernia, but also in allaying the sickness and vomiting.

A safe and convenient mode of employing cold consists in the application of a bladder containing water cooled by the solution of salts. For this purpose, a pint of water, as cold as can be obtained from the well, is put into a bladder, and three or four ounces each of finely powdered nitrate of potash and hydrochlorate of ammonia are added to it. A fresh supply of the water and the salts should be used as soon as the liquid has become heated by its application to the body.

Mr. Key has recommended a stream of cold water to be poured upon the hernia from a kettle.

The evaporation of ether has been employed by M. Vela⁸³ and other French surgeons for reducing the temperature of herniæ. My colleague, Mr. Hey,⁸⁴ having applied the taxis without success, irrigated the tumour with ether for eight or ten minutes, and, on applying the taxis again, succeeded in reducing the hernia.

δ. *Tobacco*.—Tobacco is one of the most powerful, although not one of the safest, of the means employed for assisting the taxis. For this purpose, it has been introduced into the rectum in the form of decoction, infusion, or smoke. The last form is now seldom resorted to, as it requires a complicated apparatus for its introduction. The infusion, which is more generally used, is prepared by macerating for fifteen minutes one drachm of tobacco-leaves in one pint of boiling water. Half of the liquid, when strained, may be injected into the rectum of an adult; and the remainder in half an hour afterwards, if necessary.

The usual effects of the tobacco clyster upon the system

are, depression of the pulse, nausea, and vomiting, extreme sense of languor, complete prostration of voluntary muscular power, cold sweats and faintings. Under these effects of the tobacco, the tumour frequently loses its tension, and occasionally retires spontaneously, or may be reduced by slight pressure.⁸⁵ The effects of this remedy vary in degree in different constitutions, and may sometimes be influenced by the quality of the tobacco.

The power of tobacco in promoting the return of strangulated hernia has long been established; but, whilst its efficiency is undoubted, the danger which may attend its indiscriminate and incautious employment is equally certain. Two drachms of tobacco in infusion proved fatal to a man whose case is recorded by Sir A. Cooper.⁸⁶ A girl died in Guy's Hospital from a drachm being administered in infusion. It is stated by Mr. B. B. Cooper,⁸⁷ that a man in Norfolk died in twenty-five minutes after an infusion of half a drachm of tobacco had been injected. Various other fatal cases are recorded.⁸⁸ Such disastrous results have caused the tobacco to be less generally used now than formerly; and, if they are not sufficient entirely to forbid its use, they plainly shew that the quantity employed should be carefully proportioned to the age and strength of the patient. Moreover, the state of collapse which it produces, sometimes compels the surgeon to postpone the operation, and much valuable time is thereby lost.

ε. *Opium*.—Opium has been employed under the supposition that it is capable of relaxing the stricture. This idea, however, can very rarely be correct, as the stricture is seldom formed by muscular parts. But, although it may not act by relaxing the stricture, there is sufficient evidence to shew that it does occasionally exert a beneficial influence in promoting the reduction of hernia. The mode of its operation I do not attempt to explain.

Lassus gave full doses of opium for the purpose of effecting the reduction of strangulated hernia, and in some instances

the viscera returned spontaneously into the abdomen during sleep. Mr. Hey, in his Practical Observations, and several surgeons of the present day, have borne testimony to its occasional beneficial influence. In many instances, however, the opium was used in conjunction with venesection and antimonials; it is, therefore, impossible to decide how much of the advantage was due to the former.

Opium undoubtedly has the power of diminishing the morbid sensibility of the hernia, and of tranquillizing the disturbed condition of the alimentary canal. On these accounts it is of value when the patient has to be removed to a distance, or when a considerable time must necessarily elapse before the operator can arrive.

ζ. *Purgatives*.—Purgatives have been recommended for the purpose of exciting the peristaltic action of the intestine, and thereby extricating it from the stricture, by Munro, Sharp, Le Grand, Richter, and others. They are, however, quite ineffectual in releasing the intestine, and may be injurious by increasing the reversed peristaltic action, or by propelling more forcibly the intestinal matters towards the seat of obstruction, and thus adding to the distension and consequent inflammation of the alimentary canal above the stricture. When the omentum is strangulated, purgatives cannot exert any favourable influence in promoting its return.

Clysters copiously administered, more especially when introduced after the method of Dr. O'Beirne described below, may be beneficial in procuring a free discharge of gas and fæces contained in the lower part of the intestinal tube, and, by distending the bowel below the strictured part, may cause it to exert a degree of traction which may tend to release the parts from stricture.

η. *Evacuation of gas from the large intestine by means of a tube introduced into the rectum*.—It has been proposed by Dr. O'Beirne⁸⁹ to introduce a long flexible tube through the rectum into the colon, and to retain it in that situation,

“until the flatus contained in the large and small intestines, and ultimately in the strictured intestine, is completely evacuated, and the tumour so diminished in size and tension as to start up into the abdomen, as it often does, *proprio motu*, or be easily reduced by the taxis.” If, however, the stricture be so tight as to make the intestine impervious, it is evident that the introduction of the tube cannot possibly have the effect of emptying the hernial tumour; but, as this condition cannot be ascertained beforehand, Dr. O’Beirne argues that the practice should be adopted in all cases indiscriminately. This suggestion may in most instances be adopted with propriety, since the remedy is perfectly safe, causes but little loss of time, and does not interfere with the employment of other remedies. The cases in which he considers it to be attended with the greatest success are those of “small, recent, and strangulated enterocele, in which the constitutional disturbance is so severe and urgent, and the hernial tumour so tender, that the patient will not allow it to be touched, or cannot bear any attempts at the taxis.” According to Dr. O’Beirne, this proceeding has obviated the necessity for operation in “eleven out of sixteen cases of complete strangulation.”

The instrument and its mode of employment are thus described: “The gum-elastic tube is sixteen inches in length, considerably thicker throughout, and more bulbous at its upper extremity than that of the stomach-pump: at its lower extremity it has a brass ferule, so made as to fit bayonet-wise into an aperture in a short pipe springing from a small brass syringe; and, to give it the necessary firmness, a delicate brass wire runs spirally through its interior. I employ the tube in new-born infants as well as in adults. The syringe which I use is of brass, about seven inches long, and one inch in diameter.” “It is the small syringe belonging to the self-injecting apparatus of Mr. Weiss.” The instrument should be thrown into cold water

until it becomes stiff; then be dried, made perfectly straight, and a few inches of its upper extremity well oiled. It is then to be introduced, the patient lying on the left side, and passed up inch by inch, and as nearly as possible in the direction of the rectum. If obstruction be met with, it may be slightly withdrawn, and afterwards passed gently upwards. But, if it cannot be passed higher up without much force, attach to it the syringe, and, dipping the point of the latter into the fluid to be injected, let an assistant give two or three rapid strokes of the piston, and so as to bring the full force of a strong and unbroken column of fluid to bear upon the point of resistance; and, while this is doing, let the surgeon urge the tube firmly upwards, and it will generally pass through the obstruction, as if through a narrow ring."

2. *Operation for strangulated hernia.*

When no rational hope of relief from the taxis can be entertained, it becomes the duty of the surgeon immediately to release the strangulated parts by incision, provided the patient is not actually in a dying condition.

The division of the stricture usually constitutes the essential part of this operation; and as the stricture may be formed by tissues external to the sac, or by the sac itself or its contents, so it may in some instances be divided without wounding the sac, whilst in others its division necessarily requires the incision of the sac. Upon these circumstances are founded two important modifications of the operation for strangulated hernia, each of which must be separately considered; namely, the operation without opening the sac, and the operation involving its incision.

a. Operation without opening the sac. — It may be assumed as an indisputable truth, that the fatality of the ordinary operation for strangulated hernia, in which the sac is opened, has in part been due to the exposure and manipulation of the protruded viscera. If then the viscera can be released by any

means without exposing them to these injurious influences, and without at the same time subjecting the patient to evils of equal or greater magnitude, it is undoubtedly the duty of the surgeon so to do.

This leads to the consideration as to the practicability and the propriety of the operation.

The numerous instances (see table, pp. 119, *et seq.*) in which the stricture has been divided without opening the sac prove that this operation is occasionally, and even frequently, practicable; whilst the pathological fact of the stricture being sometimes formed by the sac itself, or its contents, shews that it is not always so; or, in other words, that there are some cases in which the operation can be performed, whilst there are others in which the division of the sac is absolutely necessary.

The propriety of the operation in those cases in which it is practicable, is a question requiring more extended consideration of the principal advantages and evils that are supposed to belong to it, which I shall defer until I have described briefly its history.

Petit⁹⁰ was the first surgeon who proposed to divide the stricture externally to the sac, and he performed the operation in 1718. The proceeding was violently assailed by his contemporaries, who raised several objections to the plan, to which he ably replied. The operation was afterwards advocated and practised by Munro.⁹¹ At the beginning of the present century Sir Astley Cooper, in writing on this subject, observed, "that the operation will be gradually introduced into general practice when it has been fairly tried; and will be found, if performed early, to be free from danger, and attended with no unusual difficulty."⁹²

More recently the attention of surgeons has been directed to the subject by Mr. Key in his valuable memoir, in which he has fully discussed the advantages of this mode of operating, the objections which have been urged against it, and the

circumstances under which it may with propriety be performed; and, in the fifth edition of Mr. Lawrence's Treatise on Ruptures, the operation is fully and impartially considered.⁹³

The chief advantages of the operation are, the avoidance of opening a large serous cavity, and the non-exposure of the viscera to the atmosphere and to direct manipulation. Besides these, the advocates of the measure enumerate other of minor and more doubtful value.

There is always great danger in opening a serous cavity, and, if the object could be attained equally well without it, it never should be had recourse to; for although extensive wounds of the peritoneum have occasionally been unattended with serious consequences, yet wounds of this membrane, whether large or small, frequently excite fatal inflammation; and in cases of strangulated hernia, which have proved fatal from peritonitis after the sac has been opened, it is impossible to say how much of the evil was due to the injury inflicted by the stricture, and how much to the wounding and exposure of the serous membrane itself. It might here be argued, that, in most cases requiring operation, a layer of plastic lymph is thrown out in the vicinity of the ring by which the sac is isolated from the general peritoneal cavity, and consequently that the opening of the sac does not usually implicate the great serous bag, but only a membranous process of very limited extent. This observation possesses some force in regard to hernia in an acute state of strangulation; but, in such cases, the operation without opening the sac is the least appropriate, as will be more fully shewn hereafter. On the other hand, in voluminous herniæ of long standing, in which strangulation is seldom acute, the sac and its contents present a large surface of serous membrane which is less perfectly separated than in the former instance, by the agglutinating layer of lymph near the ring, from the general peritoneal cavity, and in many instances even freely communicates with it.

That the exposure of the viscera to the atmosphere, and to

the immediate contact of the hand, is calculated to excite or aggravate inflammation, is too obvious to require further comment.

By dividing the stricture externally to the sac, these injurious influences may be avoided; but it has been asserted, that the evils which may attend this mode of operating more than counterbalance its advantages. The chief evils to which it is supposed to be liable are, the risk of returning the intestine or omentum in a state of actual or impending gangrene, and the reduction of the hernia and its sac in mass.

When a gangrenous portion of intestine is returned by the taxis, the force employed usually lacerates the bowel, and fecal extravasation and death are the results. If, however, the replaced intestine should have escaped the evil of laceration, death may not be the inevitable result, inasmuch as the same inflammation which separates the gangrenous portion of intestine also occasions a plastic exudation to be secreted from the surrounding as well as the opposed surfaces of the peritoneum, which, becoming organized, unites the opposed portions of the peritoneal surface together, and thus the slough is prevented from falling into the peritoneal cavity; on the contrary, it finds its way into the intestine, to be ultimately discharged by the rectum. But, before this process is completed, great risk is incurred; the surrounding plastic effusion may be imperfect, and in unhealthy and enfeebled constitutions it is often altogether deficient. In the latter case, the serous membrane pours out a liquid secretion, which by separating the folds of intestine allows fecal extravasation to take place as soon as the slough is detached; and acute pain in the abdomen, sharpness of the features, with a rapid sinking of, or an almost imperceptible pulse, are the immediate symptoms, which speedily terminate in death. If, however, a slough is separated after a portion of intestine has been returned by the ordinary operation of incision of the sac, fecal extravasation is rare; for the slough either falls into the intes-

tinal canal, and the continuity of the intestine is restored by adhesion to neighbouring parts, or the fecal matter escapes by the wound, which in most instances after a variable time spontaneously closes. (See chapter on Intestinal Fistula.) But should the intestine slough, as in the latter instance, after having been replaced by the operation without incision of the sac, the condition of the patient would undoubtedly be less favourable than in the case last mentioned, inasmuch as the undivided sac would offer a certain degree of resistance to the free escape of fecal matter by the wound, and thus produce fecal extravasation and accumulation in the peritoneal cavity. But although it must be admitted that the undivided sac may act injuriously in this case, yet I believe the amount of evil to be very trifling, and certainly in no way to be compared to the tendency to extravasation of the intestinal contents, when the intestine has sloughed after it has been replaced by the taxis; since the only barrier in addition to the recent adhesion of the integuments, as in the operation when the sac is divided, consists in a single layer of serous membrane which had already been partially detached from neighbouring structures, and would readily slough under the first burst of inflammation excited by fecal matter in immediate contact with it. It has, moreover, been ably argued by Mr. Key, that the non-exposure of the viscera to the causes of inflammation and gangrene would frequently determine the restoration of the parts to a healthy state when gangrene was impending, and would most likely have occurred, if the parts had been exposed to the atmosphere and to direct manipulation. The probability of our being able to replace a portion of intestine in a state of gangrene, or verging towards this condition, is not so great as might at first sight appear, for in most instances where such a degree of mischief exists, the viscera are so adherent to the sac, and to the peritoneum in its vicinity, from recent plastic effusion, that the replacement of the viscera, even after the stricture is divided, is altogether impracticable, without using such a

degree of force as would be perfectly unjustifiable, and the surgeon would be compelled to conclude the operation by opening the sac and exposing the viscera. A careful attention to the diagnostic marks of gangrenous hernia (see pp. 65 and 115) would still further guard the surgeon against attempting the replacement of the viscera in this condition without opening the sac.

The return of omentum in a state of gangrene is a more serious evil than the replacement of a portion of gangrenous intestine, for a dead portion of omentum within the abdomen almost invariably excites fatal peritonitis. Its structure when inflamed readily loses its vitality, on which account we should guard against the replacement of this organ even when inflamed, although still retaining its vitality (see page 138, *et seq.*) There is little doubt, however, that in many instances an inflamed portion of omentum would recover if it were precluded from exposure and handling.

The risk of reducing the hernia and its sac in mass has been urged as an objection to the operation. It is true that this accident has occurred in some instances, the surgeon imagining that he had opened the sac when only the sheath of the femoral vessels had been divided. By forcible pressure upon the tumour in this condition the sac and its contents have been pushed into the abdomen, and the nature of the accident has been only recognized after death. But such an accident could scarcely happen to a surgeon who was designedly attempting to replace the hernia without opening the sac. Having reached the sac and incised the stricture, his mode of compressing the tumour would be conducted so as to empty it of its contents; and, should the sac as well as its contents unfortunately be pushed into the abdomen, he would instantly recognize the nature of the accident from the entire disappearance of the sac, and would immediately resort to the treatment appropriate to the case (see page 67).

It will thus be seen that there are important advantages be-

longing to the operation, but that some deduction must be made from their value in consequence of the risk to which the patient is exposed from the return of intestine or omentum in a state of actual or threatened gangrene, and from the reduction of the hernia whilst strictured by the sac; which risks, however, as above shewn, may by proper precautions be greatly diminished, if not entirely avoided. My experience certainly justifies me in recommending this mode of operating whenever it is practicable, provided the necessary precautions are taken against incurring the evils to which the operation, when carelessly performed, might be exposed: and, in order to avoid these dangers, it is important to be able in the first place to recognize the symptoms which indicate the occurrence of gangrene, or of a state verging towards it; and, secondly, to guard against employing an improper degree of force for the purpose of replacing the hernia after the stricture has been divided.

The chief indications of a gangrenous condition of the hernia are derived from the state of the tumour, and from the general condition of the patient. Discoloration of the integument, adhesion of the skin to the deeper-seated envelopes, edema or emphysema of the hernial investments, may generally be considered as indicating that the strangulated viscera are actually gangrenous, or in a state verging upon this condition. But gangrene may exist without being accompanied by these changes in the investments; when, for instance, the contact of the viscera with the sac is prevented by a copious effusion of serum into the latter, and the extension of inflammation from the viscera to the envelopes delayed, the latter may still present a healthy aspect, even whilst the former are gangrenous; and in such cases though the local indications of gangrene are necessarily absent, yet the constitutional symptoms will generally serve as a safe guide to the operator; the feeble pulse, the sunken and anxious countenance, and the clammy skin, rarely failing to announce this mischief.

Whilst the operation is proceeding, a fetid odour from transudation through the sac is sometimes perceptible. So important does Mr. Key consider this sign, that he remarks, that the operation of dividing the stricture without opening the sac should never be adopted, unless the operator is well assured of the "absence" of this fetid odour after all the envelopes except the sac have been divided. Unfortunately we possess no certain marks by which the state bordering upon gangrene can be recognized. It will, however, be a safe course, in reference to this operation, to presume that such a state exists whenever the strangulation is intense and has existed for many hours. Small herniæ generally exhibit strangulation in its most intense form, under which the viscera rapidly pass through the states of congestion and inflammation to that of gangrene. With respect to the length of time after the occurrence of strangulation at which gangrene may supervene, very much will depend upon the state of the patient. It may fairly be presumed that the parts cut off from the circulation will more readily, and at an earlier period, lose their vitality in a naturally feeble constitution, or in one infected by previous disease, than in a healthy and vigorous patient, in whom, moreover, the parts were in a previously healthy condition.

If, after the exposure of the sac and division of the stricture, the viscera do not recede under gentle pressure, it may be presumed that the contents of the sac are inflamed, and extensively agglutinated together as well as to its walls. Under such circumstances the sac must be opened, and the actual state of the viscera examined.

If it be found during the operation that the structures external to the sac do not produce the constriction, the probable inference would be that the neck of the sac itself is the seat of stricture, which in this case would render necessary the operation by incision of the sac. Mr. Key has well observed, "A prominent character of the operation, and one that

raises it above many of the objections that have been brought against it, is, that should the attempt to execute it fail, either from want of dexterity on the part of the operator, or from any peculiar difficulty in the case, the operation can be completed in the ordinary way, by laying the sac open.”⁹⁴

To obviate the risk of reducing the hernia whilst strictured by the sac, violent pressure must be carefully avoided, and the attempt must never be persisted in if the viscera do not recede on very moderate pressure. Mr. Key has remarked, that “the pressure required to return the contents of the tumour, after dividing the stricture on the outside of the sac, is not more than is employed in reducing a hernia where strangulation does not exist. I would not advise more than this degree of pressure to be used.”

If the hernia have been long irreducible, it is only necessary, after the external division of the stricture, to replace the newly descended portion, and to allow the older contents of the sac to retain their position.

The relative positions of the surgeon and the patient, as well as the preliminary arrangements, being the same as in the operation by incision of the sac, will be considered when the latter is described; and the modifications adapted to the different species of hernia will be mentioned under their respective heads.

In conclusion, I would again express my opinion, that the operation without opening the sac ought to be performed in all cases in which it is practicable, unless the local or general symptoms indicate the existence of gangrene or an advanced stage of inflammation. In accordance with this opinion it may be stated, as a general rule, that the operation should be attempted—1st, in most cases of large herniæ; 2ndly, in many herniæ of middle size; and 3rdly, in but few small herniæ, unless in the earliest stage of strangulation.

As it is impossible in most instances to determine with certainty the seat of stricture before operating, the prac-

ticability of the operation must generally be doubtful. But, as has already been stated, if the attempt by this operation should fail, the sac may still be opened.

I am informed by my friend Mr. Key that the advantages of this mode of operating have been fully borne out by his practice, and that he has not met with a single case in which any inconvenience or danger arose from not opening the sac. Mr. Key observes that he meets with but few cases of strangulated hernia, requiring operation, in which it is not desirable to avoid opening the sac, even when from some circumstance it is not practicable.

Mr. Liston, in an obliging communication with which he has lately favoured me, states that for several years he has been in the habit of *trying* in all cases of *recently* strangulated hernia, when the operation was required, to divide the stricture and return the protruded parts without opening the peritoneal sac. The risk to the patient he considers to be thereby greatly diminished.

A modification of this operation has been successfully practised by Munro and Sir Astley Cooper in large herniæ, when the division of the stricture externally to the sac is impracticable, on account of the constriction being produced by the sac itself. In these cases a small opening only is made into the sac, and, a director being introduced, the stricture is divided from within the sac; the direct manipulation, and the complete exposure of the viscera, being in this way prevented.

The following table exhibits the leading features, and the result of the recorded cases which have fallen under my notice, as well as several unedited cases, in which the operation without opening the sac has been performed.

Of the 32 cases noticed in the table, 27 recovered, 4 died, and the result of 1 is not stated. Of these, 18 were femoral herniæ, 11 inguinal, and 3 umbilical.

TABLE OF CASES OF STRANGULATED HERNIA IN WHICH THE STRICTURE WAS DIVIDED EXTERNALLY TO THE SAC.

No.	Name of operator, and reference.	Age.	Sex.	Species, size, and duration of hernia.	Character and stage of strangulation.	Result.	Remarks.
1	Petit quoted by Key, Mem. p. 29.	Aged	Female	Femoral.		Recovery.	
2	Munro on Bursæ Mucosæ, fol. p. 43.	35	Female	Femoral.	Three days strangulated.	Recovery.	
3	Munro.		Male	Hernia congenita.			
4	Munro.	60	Male	Large inguinal.		Recovery.	The intestine was readily returned into the abdomen, except a small adherent portion, which was allowed to remain in the sac.
5	Sir A. Cooper, part i. p. 63. Second Edition.	54	Male	Enormous inguinal of long standing.		Recovery.	Stricture removed by dividing the lower edge of the transversalis muscle.
6	Sir A. Cooper.	52	Female	Large umbilical, old, irreducible.		Recovery.	
7	Key, Memoir, p. 129.	44	Male	Small femoral, old.		Recovery.	
8	Key, Memoir, p. 134.	61	Female	Femoral.		Recovery.	
9	Key.	67	Female	Umbilical, very large, of forty-two years' duration.		Recovery.	Part of the hernia irreducible.
10	Howitt, Lancet, March 4, 1837.	41	Female	Femoral, size of pigeon's egg.		Recovery.	
11	Lloyd, Medical Gazette.	80	Male	Scrotal.		Recovery.	Intestine returned, a portion of irreducible omentum allowed to remain in the sac.

TABLE OF CASES—*continued*.

No.	Name of operator, and reference.	Age.	Sex.	Species, size, and duration of hernia.	Character and stage of strangulation.	Result.	Remarks.
12	T. P. Teale.	68	Male	Large scrotal, old.		Recovery.	
13	T. P. Teale, Prov. Medical Journal, July 1842.	69	Male	Scrotal, large, of seven years' duration.	Strangulated fifty hours.	Recovery.	
14	B. B. Cooper, Guy's Hospital Reports, 1210.	48	Female	Femoral, size of swan's egg, five years.	Strangulated five days.	Death.	Peritonitis, omentum of a dull brown colour, intermixed with green, and its veins turgid with dark blood.
15	B. B. Cooper, Guy's Reports, 2393.	50	Female	Femoral, size of half an orange, first perceived two days before operation.	Strangulated two days.	Recovery.	
16	B. B. Cooper, Medical Gazette, Dec. 1843.	41	Female	Femoral, four years, size of hen's egg, very tense.	Strangulated thirty hours.	Recovery.	
17	Luke, Lawrence on Ruptures, Fifth Edition, p. 284.	24	Male	Scrotal, large, tense, extremely painful, countenance anxious.	Operation soon after strangulation.	Recovery.	In seven weeks the hernia descended again and became strangulated. It was necessary to open the sac.
18	Calloway, Guy's Reports, April 1843.	85	Female	Femoral, old, size of an egg.		Death.	Proceeded favourably for four days; after which she gradually sank, and died on the fifth—no inspection.
19	B. B. Cooper, Guy's Reports, 1843.	68	Male	Femoral, size of a goose's egg.		Death.	Intestinal obstruction relieved, extensive erysipelas—no inspection.
20	Key, Guy's Hospital Reports, 1843.	48	Female	Femoral, larger than a pigeon's egg.	Strangulated forty-one hours	Recovery.	
21	Key, Guy's Reports, 1843.	35	Female	Femoral, small, very tender.		Recovery.	

22	Key, Guy's Reports, 1843.	9	Female	Femoral, small, tense, and of several years' standing.		Recovery.	
23	Dr. Duncan, Northern Journal of Med., Nov. 1844.	70	Male	Right inguinal, large, of many years' duration.		Recovery.	
24	Dr. Warren, American Journal of Med. Sciences, Jan. 1845.	77	Male	Oblique inguinal, previously reducible, large.		Rapid recovery.	
25	Dr. Warren, American Journal of Med. Sciences, Jan. 1845.	32	Male	Inguinal, fifteen months' duration, previously reducible.		Recovery.	
26	Mr. Solly, Medico-Chirurg. Trans., Dec. 1844.	20	Female	Femoral.		Recovery.	
27	Mr. Smith, Leeds Infirmary.	57	Male	Umbilical, previously irreducible, large.		Recovery.	
28	Liston.	49	Male	Oblique inguinal, large, ten years.	Strangulated forty-eight hours.	Recovery.	
29	Liston.	73	Female	Femoral, nine years.	Strangulated twenty hours.	Death from erysipelas 36 days after operation.	
30	Liston.	49	Female	Femoral, five years.	Strangulated three days.	Recovery.	
31	Liston.	46	Female	Femoral, eight years.	Strangulated six hours.	Recovery.	
32	Liston.	70	Female	Femoral, eight years, size of hen's egg.	Strangulated about thirty hours.	Recovery.	

b. Operation involving the opening of the sac.—No stage of strangulation, if the patient be not actually dying, should be regarded as too far advanced for this operation. Even a state of gangrene and incipient collapse should not deter the surgeon from undertaking it; for, in this unpromising condition, a free opening into the gangrenous part, so as to allow the obstructed intestine to be unloaded, will in many instances cause the pulse to rise and the temperature to be restored. But although an advanced stage of strangulation should not forbid the operation, yet it must ever be remembered, that, the earlier the protruded parts are relieved from stricture, the greater is the probability of success.

a. Preliminary arrangements.—The shoulders and trunk of the patient being protected with warm clothing, and the thighs and legs with woollen stockings and drawers, the hair shaven from the parts in the neighbourhood of the hernia, and the bladder emptied, the patient is placed upon a table or firm bed of convenient height, in a situation commanding a good light, and of easy access to the surgeon and his assistants.

In most cases of hernia it is convenient to place the patient with his right side close to the edge of the bed, so that the surgeon, by taking his seat near the patient, is enabled with his right hand to reach without inconvenience the right groin, the umbilical region, and even the left groin, according to the situation of hernia, unless the patient be of large size; in which case it is better for the patient to be drawn down to the lower edge of the bed, having the legs separated and resting upon chairs, so that, in the event of the hernia being on the left side, the surgeon can be seated between the legs, and his right hand have free access to the left groin.

β. Incision of the envelopes.—The incision of the skin, varying in direction in different species of hernia, and extending over the centre of the tumour throughout its whole length if it be small or of moderate size, but only

along the upper central half or third when large, is made by pinching the skin into a fold, which should be transfixed at its base by the scalpel, and divided by cutting upwards. If the superficial fascia should not have been raised and divided along with the skin, it should be next cut through to the same extent; after which the deeper-seated structures, varying in thickness in different species of hernia, should be divided in succession, each being successively raised by the forceps, cautiously perforated by the scalpel, and more extensively divided upon a director, until the sac is reached. This membrane must now be raised by the forceps, or pinched up between the finger and thumb, and being rubbed between them, in order thereby to separate it from the contained parts, opened by slight touches of the scalpel held nearly horizontally; which being accomplished, a director should be introduced, and the more extensive division effected by carrying the scalpel along the groove with its edge directed from the abdomen.

When the sac is opened, an escape of serous fluid is usually observed. This fluid is sometimes so scanty that the sac and its contents are in contact throughout a great part of their extent, so that in this case more than usual care is requisite to avoid wounding the intestine at the time of opening the sac. The fluid is sometimes transparent, but more frequently it is slightly tinged with blood. Occasionally it possesses a fecal odour, from transudation through the mortified coats of the bowel; and is sometimes also turbid, from fecal effusion.

It is important to be able to decide, whilst the operation is proceeding, whether the structure which has been last exposed be intestine or merely the sac. By attention to the following circumstances our decision may generally be formed without much difficulty. If the structure in question exhibit minute and general filamentous connexions, and not the polished aspect nor the vascularity of intestine; or, when

pinched up between the finger and thumb and rubbed between them, it can be detached from an internal substance or nucleus, it must be regarded as the sac, or as one of the envelopes still more external, which requires division. If on the contrary it is not externally connected by common filamentous tissue, but is either perfectly unadherent, or connected by a soft layer of newly-deposited lymph, or by old organized adhesions;—if it possess moreover the polished aspect of serous membrane, which, however, may be obscured by a layer of lymph, or lost from gangrene;—if it possess again a high degree of vascularity, which is, however, sometimes obscured by a general sanguineous infiltration beneath the peritoneum;—and if on pinching it gently into a fold, and endeavouring to detach from it a structure more internal, no nucleus can be detected, it must be regarded as the protruded viscus itself.

γ. Incision of the stricture.—Having opened the sac, the operator passes the finger towards its upper portion, so as to ascertain the seat of stricture. This part of the operation is sometimes facilitated by drawing down the sac whilst an assistant pushes the abdominal muscles upwards, by which proceeding the stricture may occasionally be brought into sight. The stricture being discovered, the surgeon insinuates behind it, when practicable, the tip of the left fore-finger, upon which he introduces the hernia knife of Sir Astley Cooper, (see fig. 10, p. 125,) with its flat surface applied to the finger; and, having passed it beyond the stricture, he divides the latter by turning upwards the edge of the knife, and gently passing it against the resisting band. If the stricture should prove unyielding, or require more extensive division, increased pressure is made by raising the handle of the instrument, whilst the point rests firmly upon the finger. A very slight touch with the edge of the knife against the constricting band is generally sufficient to release the strangulated parts, and it is never necessary to extend the division

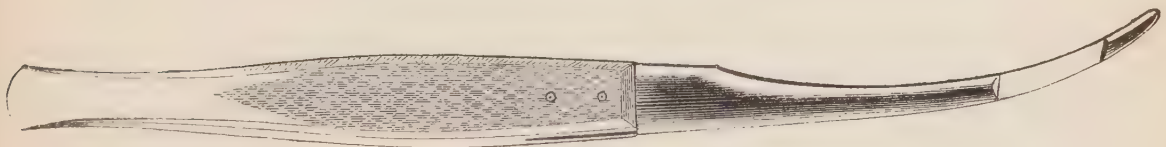
of the stricture further than to allow of the introduction of the finger into the abdomen by the side of the protruded parts. The direction in which the stricture should be divided requires variation according to the different species of hernia.

When the stricture is so tight that the tip of the finger cannot easily be insinuated beneath it, one of the hernia directors described below may be employed. In using these instruments great caution must be observed to avoid wounding the intestine, which should be pressed aside by the finger of an assistant.

As soon as the stricture is divided, there is frequently a discharge of serum from the abdomen, which, when turbid or sanguineous, denotes the existence of peritoneal inflammation within the abdomen, requiring serious attention during the subsequent treatment. Various instruments have been contrived, having for their object the guarding against any injury to the intestine while dividing the stricture, of which the following are those which require particular notice.

1. *Hernia Knife recommended by the late Sir Astley Cooper* (see fig. 10).—The knife devised by Sir Astley Cooper for the

Fig. 10.



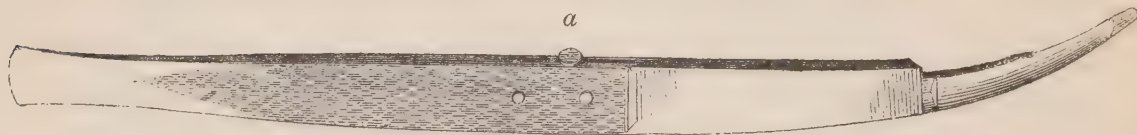
Sir Astley Cooper's Hernia Knife.

division of the stricture, and which answers the purpose remarkably well, resembles in size, curvature, and breadth the common curved bistoury. It is blunt at the end for about half an inch, has then a cutting edge for about three quarters of an inch, and is again blunt along the rest of its concavity.

2. *Sheathed Bistoury constructed by Mr. Weiss, after the*

suggestion of Mr. B. B. Cooper (fig. 11).—This is also a curved bistoury, having a blunt extremity about three tenths of an

Fig. 11.



Sheathed Bistoury constructed by Weiss after the suggestion of Mr. Bransby Cooper.

inch in length, and then a cutting edge an inch in length, which is guarded by a sliding watch-spring sheath. This is to be drawn back by means of the little head, *a*, placed at the junction of the blade with the handle, after the knife has been introduced within the stricture, and is supposed to prevent still more effectually the chance of wounding the intestine. Another form of bistoury has been used by Mr. Turner, which may be termed

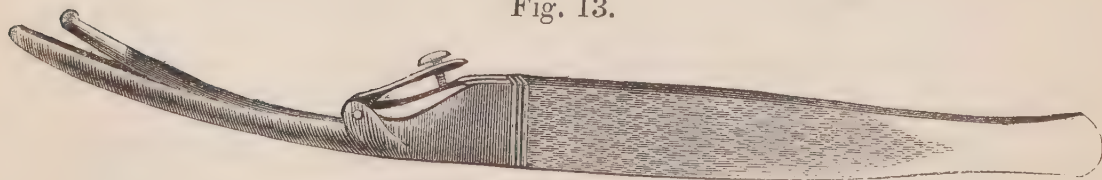
3. *The Concealed Bistoury* (figs. 12 and 13).—In this

Fig. 12.



Concealed Bistoury used by Mr. Turner.

Fig. 13.



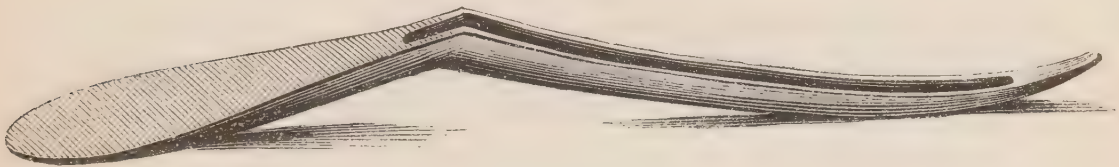
The same instrument with the blade raised.

bistoury the knife, which is probe-pointed and has a cutting edge of about half an inch in length, is concealed within a deep groove, to which it is connected by a hinge, *a*. It is kept concealed in the groove by means of a spring,

and is raised when necessary, or during the operation, or after it has been introduced within the stricture, by pressure of the operator's thumb upon the milled head, *b*.

4. *Hernia Director described by Mr. Lawrence* (see fig. 14).

Fig. 14.

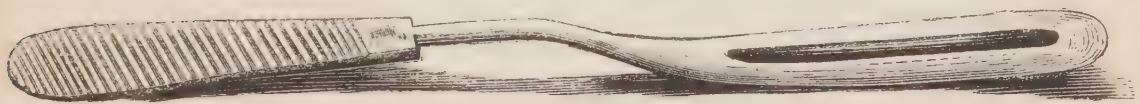


Hernia Director described by Mr. Lawrence.

—Mr. Lawrence⁹⁵ has described a curved steel director, the length and curvature being about the same as those of the hernia knife. The extremity should be small, well rounded off, the depth of the groove gently increasing to the handle, where it should be a quarter of an inch. The handle should be large enough to give a firm hold, and the groove deep, and should terminate short of the extremity by a quarter of an inch. For many years I have used this instrument, and it has satisfactorily answered the purpose for which it was intended.

5. *Hernia Director employed by Mr. Key* (see fig. 15).—

Fig. 15.



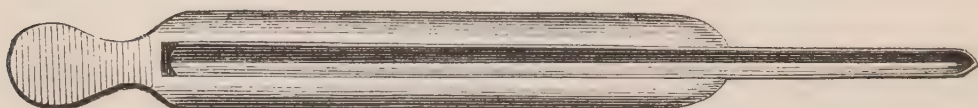
Hernia Director employed by Mr. Key.

Mr. Key⁹⁶ has employed a flat director, somewhat similar to that of Petit. The blade is below the level of the handle, and is slightly curved; the extremity being flattened to enable it to pass with more facility under a firm stricture. This instrument is well adapted to the operation in which the stricture is divided externally to the sac; it is equally applicable to the operation by incision of the sac, and by

its breadth is calculated to protect the intestine ; but the fingers of an assistant are, nevertheless, in most instances also necessary for the protection of the bowel.

6. *Winged Director devised by Mr. Turner* (see fig. 16).—

Fig. 16.



Winged Director devised by Mr. Turner.

I have lately been favoured by my friend Mr. Turner, of the Manchester Infirmary, with a winged director, which resembles an ordinary director attached to the upper surface of a thin slightly convex plate of steel, terminating in a rounded extremity like the finger-nail, and allowing the grooved director to project about an inch beyond it. The object of the plate of steel projecting laterally from this director is to protect the intestine during the incision of the stricture. A winged director was used by Petit; but the instrument devised by Mr. Turner appears to be much more easy of application, as well as better calculated to protect the viscera from injury.

δ. *Examination and treatment of the protruded intestine.*—As soon as the strangulated viscera are exposed, it becomes the duty of the surgeon to subject them to careful examination, in order to ascertain their condition, that he may be able to decide upon the treatment they may require.

Preparatory to this examination, an additional portion of the viscera should be gently drawn down; by which procedure the release from stricture of the protruded parts can be determined, and the kind and degree of injury sustained by the part which has been more immediately subjected to the pressure of the stricture ascertained.

The pathological changes consequent upon strangulation have already been considered in a former chapter (page 59,

et seq.); the treatment required under the principal pathological conditions in which the protruded intestine is found will next be described.

1. *Treatment of the intestine when hyperhemic.*—There are no degrees of discoloration of the intestine, short of its vitality being extinct, which forbid the replacement of the part within the abdomen. This rule applies to all the varieties of discoloration observed under inflammation or congestion of the protruded part. A brief recapitulation of these changes of colour may not be out of place. In inflammation, the intestine exhibits various shades of red colour, more or less florid, and the vessels are seen to have an arborescent arrangement. When congested, its minute vessels, distended with dark-coloured blood, are distinctly visible; or its coats present an uniform discoloration, of a chocolate, claret, purple, or blackish hue, the individual vessels being concealed from view by infiltration of blood beneath the peritoneum.

In reference to these hyperhemic states of the intestine, the surgeon has to determine, as far as he is able, whether the intestine be still living, or, in other words, whether its vessels are capable of transmitting blood. This question he endeavours to determine in the following manner. He waits for a few moments after the parts are liberated from stricture, and observes whether the discoloration becomes less intense; or he presses the blood out of the distended veins, and sees whether they become rapidly refilled. If no evidence of the circulation existing is thus obtained, the intestine may be covered with the integuments, or with a warm moist sponge; and after the lapse of a little time, when it is again examined, perhaps a slight diminution of the intensity of the discoloration may be detected. Should these means fail, the surface of the intestine may be slightly scarified by the point of a lancet, when a slight oozing of blood will perhaps be observed. It is scarcely

necessary to allude to the extreme care and delicacy which are requisite in making this experiment. If, from any of these expedients, evidence can be obtained that the vessels of the intestine, throughout the whole extent of the protruded portion, are still capable of transmitting blood, however deep the degree of discoloration may be, such portion of intestine may be returned within the abdomen. Sir B. Brodie,⁹⁷ having failed to obtain proof of vitality from the usual modes of observation, scarified the surface of the intestine, and, having observed blood flow from the divided vessels, replaced it. The result of the case was fortunate.* Before returning the intestine, it must be subjected to gentle pressure, in order that it may be emptied of its contents; and, when the bulk of the protrusion has thus been diminished, the intestine may be carefully pushed in successive portions into the abdomen, until the whole of it is replaced. The surgeon should afterwards pass his finger fairly within the abdomen, to determine that no portion of intestine is engaged within the sac, as well as to determine that, in returning the protruded knuckle of intestine, it had not been invaginated within a neighbouring portion of the intestinal canal.

2. *Treatment of the intestine when gangrenous.*—When the intestine exhibits the deeper shades of discoloration, and no evidence can be obtained that its blood-vessels are still capable of transmitting blood, although the unequivocal marks of gangrene be not established, it must be treated as if it were undoubtedly gangrenous. When gan-

* Richter states, that, whatever be the degree of inflammation of the intestine, and however it may be altered in colour, provided it retain its natural consistency and lustre, it ought to be replaced.—*Traité des Hernies*, 2e édit. p. 216. Scarpa says that a portion of intestine of a livid and even black colour is not necessarily gangrenous. Mr. Lawrence entertains no doubt of the propriety of returning into the abdomen deeply discoloured intestine of a deep chocolate brown, dark livid and nearly black tint.—*Treatise on Ruptures*, 5th edition, p. 296.

grene is fully established, the dead portions of intestine present considerable diversity in their colour. If the gangrene have resulted from simple congestion or from mechanical obstruction of the vessels, the part exhibits an uniform purple or black colour; its lustre is diminished, its serous membrane may easily be detached, and its coats are soft and lacerable. When the gangrene has resulted more immediately from inflammation than from a mechanical arrest of the circulation, it is usually limited to distinct spots or patches, which are of an ash-grey or greenish tint, devoid of lustre, soft, and lacerable. The gangrenous parts may be found more or less completely detached by ulceration, and the bowel perforated.

When the *gangrene is general* or even extensive, an incision must be made throughout the whole length of the gangrenous portion of intestine, which must be left in the sac to be detached by the sloughing process. The opening thus made generally allows of the free evacuation of the contents of the upper portion of the alimentary canal, without division of the stricture. If, however, the stricture should still afford a material obstacle to the discharge of the intestinal contents, a director must be passed beneath it, and its division effected with as little disturbance as possible of the neighbouring adhesions.

The wound must afterwards be left open, to facilitate the free discharge of matters, and simply dressed with wet linen frequently renewed.

The process by which the natural passage of the fæces is sometimes spontaneously restored, and the fistulous opening closed, will be described in the following chapter on Intestinal Fistula.

Louis⁹⁸ maintained that the division of the stricture was not necessary for the evacuation of the intestinal canal, after a free incision had been made into the gangrenous portion of intestine: and Mr. Travers⁹⁹ has strongly objected to the

division of the stricture under these circumstances, on the ground of its disturbing the adhesions, and being unnecessary for the evacuation of the bowel; nevertheless, he admits that this rule of treatment may have exceptions. "If," says Mr. Travers, "the stricture should still be sufficient to retain the matters, which will seldom be the case, a moderate dilatation of it will be required." Mr. Lawrence, coinciding with Mr. Travers in opinion that the division of the stricture is generally unnecessary, states, that if the stricture be so narrow as to interfere with the discharge, an incision must be made to afford the requisite room. To ascertain this point, as well as to discover whether there be any interior constriction, Mr. Lawrence recommends that the end of the little finger, or a female catheter, be cautiously introduced into the bowel.¹⁰⁰ Arnaud¹⁰¹ and Dupuytren¹⁰² divided the stricture when the fæces did not freely escape. The general practice of Sir A. Cooper was to divide the stricture. Mr. Key¹⁰³ is of opinion that the danger of disturbing the adhesions has been exaggerated, and states that a director may be passed between the intestine and the stricture without materially disturbing the adhesions.

The practice of excising the gangrenous parts, and attempting to unite the divided extremities of the intestine by suture, as recommended by Brasdor and others, is now universally abandoned.

It was formerly the practice to retain the gangrenous intestine by a ligature through the mesentery, to prevent the divided portion of intestine being retracted within the abdomen, and the consequent effusion of fæces into the peritoneum; but Desault¹⁰⁴ and Scarpa¹⁰⁵ have shewn that the adhesions which precede and accompany the gangrenous condition of the intestine effectually retain it in its position, and render the ligature unnecessary. Mr. Travers has strongly expressed his opinion on this subject. He states that, "uniformly and without exception, the peritoneal tunic of the gut adheres to

the peritoneum of the parietes at its margin;” and again, “that the strangulated part is always fixed by adhesion when it quits the belly, and that this adhesion creates much of the impediment commonly experienced to the return of the gut in the operation.” Not only is the ligature unnecessary, but it is shewn by Scarpa to be also injurious, by counteracting to a certain extent the subsequent process of spontaneous cure. (See chapter on Intestinal Fistula.)

When the *gangrene is partial*, being limited to one or more circumscribed spots, leaving the intermediate portion of intestine comparatively healthy, the stricture should be divided and the intestine replaced, unless the separation or decomposition of the gangrenous patches be so far advanced that perforation may be immediately expected. In the latter case it is better to treat the part as if it were actually perforated. If the patches are so numerous or extensive as to give to the protruded part a general gangrenous character, it should be treated as if the whole of it were gangrenous; namely, by freely opening the intestine and leaving it in the sac, with or without division of the stricture, as circumstances require.

When a portion of intestine affected with one or more patches of gangrene is returned into the abdomen, as recommended above, the adhesive process preceding the separation of the slough prevents the effusion of fæces. This fact has been established by the researches of Desault, Scarpa, and Travers. The slough, when detached, either falls into the intestinal canal, and the breach produced by its separation is repaired by a contiguous portion of serous membrane, or, from the opening in the intestine being in close proximity to the external wound, its detachment is followed by fecal discharge, which in most cases soon spontaneously ceases.

3. *Treatment of the intestine when perforated.*—When the intestine is perforated by a single aperture only, and is in other respects tolerably healthy, the aperture may be closed,

as recommended by Sir Astley Cooper,¹⁰⁶ by a fine silk ligature, with both its ends cut close to the knot, and the intestine replaced within the abdomen. If the aperture be large, the treatment by ligature is inadmissible, on account of the obstruction it might occasion from reducing the capacity of the bowel. In this case a free incision must be made through, and sometimes beyond, the gangrenous part, which must be allowed to remain in the sac ; and, if necessary for the evacuation of the bowels, the stricture must be divided.

When the protruded portion of intestine is of large size, and in a suitable condition for being returned, with the exception of the gangrenous or perforated spot which requires incision, the more healthy part of the protrusion may be replaced, whilst the gangrenous portion must be opened, and retained in the sac by a temporary ligature through the mesentery. The use of the ligature is in this instance recommended, on account of the disturbance of the adhesions being necessarily too extensive to allow of the partial replacement of the protrusion. The ligature may be removed in four or six hours.

Velpéau,¹⁰⁷ confiding in the extent of the adhesive process and the pressure of the abdominal muscles in preventing fecal effusion, in two instances returned the bowel, although it was perforated by ulceration. Both cases terminated favourably. Mr. Long is reported by Mr. Lawrence to have returned a portion of intestine, in which there was a perforation resembling a small pin-hole. In a few days the whole of the contents of the bowels were discharged from the wound ; in three weeks the patient began to have fecal evacuations by the natural passage, and in a short time the wound cicatrized.

Notwithstanding the success which may occasionally attend this mode of treatment, the replacement of a perforated portion of bowel cannot be regarded as free from risk. By the act of replacement the adhesions are disturbed to a con-

siderable extent, and the pressure requisite for the return of the bowel may force some of its contents into the peritoneal bag. It is then on the whole more prudent not to return a perforated portion of bowel, unless the aperture be so small that it admits of being closed by the ligature without materially diminishing the capacity of the bowel.

4. *Treatment of the intestine when it exhibits an indentation from the stricture.*—If the coats of the intestine are not seriously injured, but its capacity is diminished from puckering of the mucous membrane, it must be returned into the abdomen, “the diameter having been first restored by carefully extending the constricted portion.”¹⁰⁸ Even when the intestine is thinned at the part constricted, in consequence of ulceration of the inner coats, it may be returned after division of the stricture, provided the process of ulceration has not advanced so far as to expose the part to the risk of perforation in the act of replacing it. Dupuytren¹⁰⁹ returned a portion of intestine so thin from the pressure of the stricture, that it appeared to be reduced to its peritoneal coat; and yet the patient recovered. He operated successfully in the same manner in another case, in which the inner and middle coats of the bowel were destroyed to the extent of three or four lines.

If the intestine be actually perforated at the site of stricture, or so thin that laceration may be expected to occur from the pressure requisite for its return, it should be opened to a sufficient extent to allow of the free evacuation from time to time of the contents of the alimentary canal, and allowed to remain in the sac. If only one extremity of a large coil is perforated, the other may be replaced; and it will then be prudent to retain the opened portion in the sac by a temporary ligature through the mesentery.

5. *Treatment of the intestine when adherent.*—Adhesions of the intestine require great modifications of treatment, according to their situation and character.

Recent adhesions of the intestine to the sac or omentum may be destroyed by the finger, or handle of the scalpel, provided the intestine be not in a gangrenous state; in which case it must be treated in the manner already described. If the two sides of a coil of intestine are united to each other by a layer of plastic matter, this adhesion ought in the same way to be destroyed; as, from the neglect of this precaution, the intestine has been held in such an angular form after its return into the abdomen, as to occasion obstruction to the passage of the fæces, speedily followed by death. Recent adhesions of the intestine to the mouth of the sac are generally destroyed by the act of drawing down the intestine after the stricture has been divided, or during the replacement of the protruded viscus. After the intestine is returned, the finger should be passed through the ring into the abdomen, to ascertain that no part of the late protrusion is injuriously confined by plastic matter.

Old organized adhesions uniting the intestine to the body of the sac, when of moderate extent, must be cautiously divided by the knife, unless they unite the parts closely to each other; in which case portions of the sac must be dissected out, and returned with the intestine.

When the adhesions are of great extent, and cannot be overcome without tedious or dangerous dissection, their division is improper. The stricture should be divided, and the intestine allowed to remain in the sac. This practice, adopted by Petit and strongly inculcated by Scarpa, should be preferred to the more hazardous treatment practised by Arnaud.¹¹⁰ This celebrated surgeon, in a case of adherent enteropiplocele, was engaged an hour and a quarter in destroying the adhesions. It has, moreover, been observed in several cases of adherent intestine, treated by the simple division of the stricture, that after a time both the intestine and sac have spontaneously retired within the abdomen. Richter¹¹¹ and Scarpa have recorded cases exemplifying this remarkable

process of restoration, and more recently a similar case has been recorded by Mr. Lizars.¹¹²

Slight adhesions of the intestine to the neck of the sac may be divided by the knife, after the part has been brought into view by drawing down the sac, and extending the incision of the integuments upwards. Even when the adhesions were extensive, Sir Astley Cooper¹¹³ was in the habit of detaching them, but he admits that the proceeding was one of great difficulty. In such cases a less experienced operator would act more prudently by simply dividing the stricture, and allowing the adhesions to remain.

In some rare instances, not only is the stricture formed by the neck of the sac, but the intestine is firmly adherent to the whole circumference of the neck of the sac, so that it is impossible to insinuate a director or probe between them. Under these circumstances, Arnaud adopted in two cases the bold practice of making a free incision into the protruded intestine, and dividing the stricture from within.¹¹⁴ In the first case the patient recovered, and the fecal fistula was closed on the fortieth day: in the second case the relief was complete, and the fistula was closed on the twenty-fifth day; after which the fæces took their natural course for a few days, when an ignorant person, with the design of reopening the intestine, having introduced a probe, perforated the bowel, and destroyed the life of the patient.

Although the intestine may not be adherent to the sac, it sometimes cannot be replaced, in consequence of bands of adhesion within the abdomen. These bands should be cautiously divided by probe-pointed scissors conducted along the finger. Arnaud¹¹⁵ having divided the stricture, and detached several plastic adhesions, was unable to replace the intestine: on searching with his finger, he found, about the depth of four finger-breadths within the abdomen, a bridle, three inches long, of a hard and solid consistence, which retained the intestine. He conveyed the scissors on his finger to the resisting band,

and cut it with great ease. The intestine afterwards entered almost of its own accord.

The natural filamentous adhesions, which sometimes retain the protruded cæcum or sigmoid flexure of the colon, must be allowed to remain undisturbed during the operation, the stricture having been divided ; and, if the viscus have not descended very far, it may in some instances be subsequently replaced, by the gradually operating influence of recumbency and gentle pressure by a truss with a hollow pad.

ε. *Examination and treatment of protruded omentum.*—After the stricture has been divided, the omentum, if any be contained in the sac, should be gently drawn down to ascertain that it is perfectly liberated from constriction.

The surgeon must now carefully ascertain that no portion of intestine is concealed by the omentum. For this purpose he gently unfolds it, and passes the finger by its side into the abdomen. Without great care, a small knuckle of intestine might be so concealed as to escape detection. I lately assisted Mr. Smith at the Leeds Infirmary in an operation which exemplifies the force of this observation. On opening the sac, a portion of omentum was found adherent throughout to its neck ; and, on drawing down the omentum, the continuous line of adhesion of this substance to the whole circumference of the neck of the sac was distinctly visible. By further examination of the omentum it was found to be coiled into a long tube, at the upper part of which Mr. Smith felt a small knuckle of intestine completely embraced by the omentum. The operator's attention should next be directed to the quantity and condition of the omentum. If the omentum be *small in quantity* and perfectly healthy, it may be returned into the abdomen ; but if *a large portion* of this structure be protruded, although it may be perfectly healthy, it is better to remove it by excision, than to replace it within the abdomen. The favourable result which attends the removal of the omentum, when the precautions to be noticed below are observed, renders this

proceeding one of comparative safety ; whereas the exposure of a large mass of omentum to the atmosphere, and the mechanical injury which it sustains during the strangulation, and in the act of replacement, are frequently followed by inflammation of the replaced part, which, from possessing only a low degree of vitality, soon becomes gangrenous. On these grounds it is better, when the protruded portion of omentum is large, to remove it by excision, than to run the risk of its becoming inflamed and gangrenous within the abdomen.

Various other conditions of the omentum render it unfit to be returned. If it be inflamed, or gangrenous, or materially altered in structure, its removal is necessary, as the death of the patient has frequently resulted from returning a portion of omentum in these conditions. The same evidence of vitality, viz. veins quickly refilling after being emptied by pressure, which would justify the surgeon in returning a portion of intestine, ought not to be considered sufficient in the case of the omentum. From the great difference of vascularity of the two parts, or from the comparatively low degree of vitality of the omentum, there is no parallel ; for the inflamed intestine, when released from stricture and placed within the abdomen, generally recovers its healthy state ; whereas the inflamed omentum as generally dies, and, acting as a foreign body, excites fatal peritonitis. Omentum which has suffered from contusion or laceration during the injudicious use of the taxis, should be removed, since it is liable to become inflamed, and in this state may excite distressing and even fatal inflammation within the abdomen.

Mode of removal of diseased omentum.— Careful examination having been made to determine that no portion of intestine is concealed within that part of the omentum to be removed, an assistant should lay hold of the upper portion of it with his fingers and thumb, or retain it by a temporary ligature, as the spermatic cord is held during excision of

the testicle, to prevent the sudden retraction of the divided end of omentum within the abdomen. By neglect of this precaution I have more than once seen very troublesome hemorrhage. The risk of sudden retraction being thus guarded against, the portion of omentum is removed by the knife or scissors; after which each bleeding vessel is secured by a fine ligature, *one of the ends being cut close to the knot, whilst the other is allowed to pass out of the wound.* When all the vessels are secured, the divided extremity must be pushed fairly within the abdomen, and not allowed to remain as a plug at the mouth of the sac, with the view of preventing a future hernial descent, as has been sometimes recommended; for a plug of omentum is a very ineffectual barrier to the future descent of intestine, and the omentum remaining firmly adherent to the vicinity of the ring perpetuates the distressing dragging sensations at the stomach, which might perhaps have been obviated by placing it more completely within the abdomen.

Various modes of treatment have from time to time been adopted in reference to the omentum when deemed unfit to be returned into the abdomen.

When in a state of mortification, it has been allowed to remain in the wound, to be detached by sloughing. Cases thus treated have generally been favourable in their result, so far as life was concerned; but the process of separation has sometimes been attended with severe constitutional irritation, and a tedious granulating sore has generally followed. In some instances a portion only of the protruded omentum was cast off; whilst the remainder, having retained its vitality, contracted adhesions to the sac, and entailed upon the patient the evils of an irreducible epiplocele.

Omentum, retaining its vitality, but considered unfit to be returned on account of its large size or alteration in structure, has been allowed to remain in the sac after the stricture was divided, the integuments being united over it. Where

this mode of treatment has been adopted, the omentum has been occasionally found to have spontaneously returned into the abdomen at a subsequent period.¹¹⁶ But such a result is the exception, not the rule; and in most instances the patient remains the subject of adherent omental hernia, which is perpetually liable to strangulation, admits of very little relief from trusses, and favours the future descent of a portion of intestine.

Arnaud¹¹⁷ frequently employed the ligature for the removal of gangrenous or diseased omentum, and states that he never knew the practice followed by a fatal result. The symptoms, however, which were produced by the ligature were frequently so severe as to induce him to remove it. Pott¹¹⁸ relates several fatal cases in which ligature of the omentum was practised; and in the practice of other surgeons¹¹⁹ this mode of treatment has proved so frequently fatal that it is now universally abandoned.

Simple excision of the omentum without ligature of its vessels was advocated and practised by Caqué, Sharp, and Pott, but the hemorrhage which occasionally attends this proceeding renders it unsafe.¹²⁰

The mode of treatment which combines such a degree of efficiency and safety as to render it worthy of general adoption, is the excision of the omentum and ligature of its vessels. In reference to this practice Sir Astley Cooper states, that, as far as he has seen, "it is unattended with danger."¹²¹ Mr. Lawrence speaks in the same confident tone of its safety. My own experience is in perfect accordance with theirs. Indeed, those cases in which I have either practised, or witnessed the excision of large portions of omentum, the vessels having been secured by ligature, have been amongst the most fortunate of the operations for strangulated hernia which have come under my notice; for the omentum had to a certain degree protected the intestine from the pressure of the stricture, and the re-

moval of the omentum had not in any case been followed by evil consequences.

When the omentum is *adherent*, but otherwise fit to be returned into the abdomen, the adhesion may be freely destroyed with the knife.

Appendices epiploicæ, when inflamed or of a dark venous colour, or indurated, should be also removed by the knife.

§. *Accidents of the operation.*—1. *Wounds of intestine.*—The intestine has been wounded in the operation for strangulated hernia during the incautious division of the sac, and more frequently during the incision of the stricture. In such cases the edges of the wound, provided it be small, may be pinched up with the forceps, and closed by a fine ligature tied moderately tight. The ends of the string should then be cut close to the knot, when the intestine may be returned into the abdomen. A wound more extensive, which cannot be closed by a single ligature without the cavity of the intestine being so much encroached upon as to incur the risk of mechanical obstruction, may be united by two or more points of interrupted suture; the strings being cut close to the knots, and the intestine afterwards replaced. The points of suture should be sufficiently numerous to secure perfect contact of the edges of the wound, so as to prevent the possibility of fecal discharge into the cavity of the peritoneum.

When a wound of the intestine has thus been closed by ligature or by suture, the part becomes united by organizable lymph to some neighbouring portion of peritoneum; and the strings, subsequently detached by ulceration, fall into the cavity of the bowel, and are cast off with the *fæces*. Small wounds have been successfully treated by single ligature by Sir A. Cooper and Mr. Lawrence;¹²² more extensive wounds have terminated favourably, both when treated by the uninterrupted or Glover's suture, and by the interrupted. The investigations of Mr. Travers,¹²³ and the recorded cases¹²⁴ in which the Glover's suture has been employed, amply justify

the surgeon in its adoption; but a preference may be given to the interrupted suture, from the greater facility with which the strings may be disengaged by ulceration, and consequently from there being less risk of the newly deposited or recently organized plastic matter becoming absorbed.

2. *Wounds of blood-vessels.*—In the operation for strangulated hernia blood-vessels of importance have occasionally been wounded. Such accidents have never been frequent; and in the present day, when the anatomy of inguinal hernia is so much better known than formerly, they are extremely rare.

The epigastric artery has been wounded in oblique inguinal hernia¹²⁵ by the incision of the stricture being directed towards the median line; and in direct inguinal hernia,¹²⁶ when the stricture has been divided towards the ilium. Professor Benedict of Breslau divided the epigastric artery which ran across the neck of the sac in a case of femoral hernia.¹²⁷ The cremasteric branch of the epigastric artery has been divided in the operation for bubonocoele. The obturator is endangered in femoral hernia when it arises from the epigastric or external iliac, and pursues its course along the upper and pubic borders of the femoral ring. Sir Astley Cooper¹²⁸ has related a case in which there is reason to believe that the femoral vein was wounded by a surgeon who divided the stricture towards the ilium in a case of femoral hernia, which had been mistaken for inguinal. Copious venous hemorrhage occurred, which delayed the operation fifteen minutes, and was stopped with difficulty.

When a vessel of importance is wounded in this operation, the occurrence of the accident is generally announced by a profuse gush of blood. Occasionally there is no external hemorrhage, but the blood is effused internally to such an extent as to produce death.¹²⁹ On the other hand, the epigastric artery has been wounded, or completely divided, without the occurrence of hemorrhage; and in several cases the bleeding has ceased spontaneously on the occurrence of fainting.

If, from a copious flow of arterial blood, the surgeon has reason to believe that an artery of considerable size has been wounded during the incision of the stricture, he should endeavour to expose the bleeding vessel and secure it by ligature. He may, sometimes, succeed in bringing the vessel into view by drawing down the sac, and by everting the edges of the wound. In the case of femoral hernia, already noticed, in which the epigastric artery was wounded, Professor Benedict immediately secured the bleeding vessel. Sir Astley Cooper¹³⁰ has recorded a case in which Dr. Mackay was the operator: blood flowed profusely after the stricture at the internal ring had been divided upwards; Dr. Mackay introduced his fingers into the wound, and felt the two ends of the bleeding vessel pulsating strongly. By relaxing the abdominal muscles, and turning aside the edges of the wound, he was enabled to secure both ends of the vessel by ligature.

If the vessel should not be easily accessible, compression may be employed; which, in some instances, has been effectual in suppressing copious hemorrhage.

In all cases where there has been a profuse gush of blood, and the hemorrhage has ceased to appear externally, although no ligature has been applied, the case should be very closely watched, lest the hemorrhage should be continuing internally. If, from the tension of the abdomen, the character of the pulse, and the blanched aspect of the patient, there is reason to suspect internal hemorrhage, or the bleeding should manifest itself externally in an obstinate manner, a bold and decisive attempt to secure the vessel must no longer be delayed. To accomplish this object, the surgeon may introduce the left fore-finger into the abdomen, and, having guided a probe-pointed bistoury along it, he may cut the abdominal wall throughout its whole thickness, to such an extent as will allow him partially to evert the edges of the wound, so as to obtain a view of the bleeding vessel. If the case be femoral hernia in the male, an incision should

be made over the spermatic cord, which may be elevated previously to the incision of the abdominal wall.

η. *Treatment subsequent to the operation.*—Great mischief is frequently inflicted after the operation for hernia by the injudicious use of purgatives, from an undue anxiety on the part of the surgeon to secure the evacuation of the bowels. It should be remembered, that, if the bowels do not soon act after they are released from constriction, the constipation is usually owing to an inflamed state of the part which had been protruded, or of the portion of intestine immediately above it.

As a general rule, it is well to avoid all medical treatment for several hours after the operation. In many instances, the bowels soon act spontaneously after the stricture is removed; and it is better to allow them the opportunity of so doing, without provoking irritation, in their highly sensitive state, by the early administration of purgatives.

Many cases however occur, which should form an exception to this rule of avoiding all medical treatment for some hours after the operation. If, for instance, the patient be restless and irritable after the operation, an opiate is often productive of great benefit.

Inflammation within the abdomen, also, may sometimes require early attention after the operation. At each visit the surgeon must carefully examine the abdomen; and on detecting tenderness on pressure in the vicinity of the hernia, or on finding the abdomen in this part tumid and hard, or if he find a more generally diffused tenderness of the abdomen, he must assiduously employ such local and general remedies, repeated at short intervals, as are appropriate to the age and condition of the patient. Much depends upon the economy of time. Gentle means, frequently repeated, are generally of more value than heroic measures; for, in most cases in which dangerous inflammation follows the operation for hernia, the subjects are of enfeebled constitution. Venesection

to the extent of six or eight ounces repeated at intervals of about twelve hours, is often of the greatest value. In robust subjects a more vigorous depletion may be employed ; but in those who are advanced in years, or excessively debilitated, even those small bleedings are inadmissible. Leeches applied to the abdomen are often of essential use. Twelve or twenty leeches may be applied at intervals of six or eight hours ; and great benefit is often derived from the repeated application of so small a number even as six leeches when inflammatory symptoms exist in feeble subjects. Hot fomentations, bran poultices, liquid diet, attention to position so as to secure relaxation of the abdominal muscles, perfect quietude of mind and body, are the usual auxiliaries to local and general depletion in the treatment of inflammation within the abdomen during its early and more active stages. When the state of the skin, pulse, and abdomen indicate a subsidence of the inflammation, the advantage that has been gained may often be rendered permanent, or any lingering traces of inflammation may be removed, by freely blistering the abdominal surface.

If the bowels should not act spontaneously, after the lapse of forty-eight hours, mild aperients may be given, but not until the inflammatory symptoms have been subdued or mitigated. During the inflammatory stage, emollient clysters are the only means for promoting the action of the bowels, beyond those of an antiphlogistic character, that ought to be employed.

In old and enfeebled subjects, the operation is sometimes followed by symptoms of exhaustion. In such individuals the strength must be supported by nutritious fluids and stimulants, as beef-tea, wine, and ammonia ; and, if any inflammatory symptoms occur, they may be treated locally by fomentation, poultices, blisters, or by the occasional application of leeches, whilst the general strength is supported by the means just recommended.

Occasionally the operation is followed by suppuration of

the sac. The scrotum becomes red, swollen, and hard, and some febrile excitation is developed, whilst the abdomen is comparatively easy and free from tension. In this state the adherent edges of the wound must be separated, and the cavity of the sac exposed so as to allow of the free discharge of matter. Poultices and salines constitute the remaining part of the treatment.

After the incision is healed, a truss should be constantly worn.

CHAPTER XII.

REDUCTION IN MASS.

1. *General remarks on this accident.*—A hernia, strangulated by the neck of the sac, is sometimes reduced in a mass, along with the sac, the portion of the viscera which had recently been protruded still suffering strangulation. To this accident the French surgeons, whose attention was first directed to it, gave the appellations of *réduction en bloc* or *en masse*. Ledran is said to have been the first surgeon who observed this accident. Arnaud¹³¹ has related some highly instructive cases of hernia reduced in mass; and with his usual vigour and clearness has pointed out some of the most important diagnostic marks of the accident, and has described the operations which he performed for its relief. Several interesting cases in which Dupuytren¹³² operated have since been recorded; and more recently the subject has been especially investigated by Mr. Luke,¹³³ whose valuable essay tends greatly towards giving a definite character to the diagnosis of *reduction in mass*, at least so far as regards oblique inguinal hernia when thus reduced.

This accident may occur under various circumstances. In a large proportion of the cases which have been recorded, the hernia was reduced in mass by the patients themselves; in some it has been reduced by the surgeon whilst using the ordinary manipulations of the taxis; and in a few instances this accident has occurred during the operation for strangulated hernia,—the surgeon having pushed the unopened sac and its contents into the abdomen, imagining that he had

exposed the intestine, when the sac only was laid bare ; or, having opened the sac and divided the ring which he supposed to constitute the stricture, he has pushed the intestine into the abdomen while it was still constricted by the neck of the sac.

It is an error to suppose that the exercise of great force is necessary for the production of this accident. Although it has sometimes occurred under the employment of an unjustifiable degree of violence, yet it should not be overlooked that it has occurred under the employment of very moderate and justifiable pressure. In one case, as may be seen by reference to the following table, the hernia was “easily reduced;” in another it is stated that “very little force” was used; and indeed there is reason to believe that this reduction in the lump may even occur spontaneously, as in one of the cases which came under the notice of Dupuytren.

A contracted and indurated state of the neck of the sac, and a wide hernial aperture, are the chief, if not the essential, conditions which favour the occurrence of the accident. The tendency of the neck of the hernial sac to contract, especially during the use of trusses, has already been explained. As before observed, while the neck of the sac is undergoing this change, it also becomes more loosely connected by filamentous tissue to the hernial aperture or canal by which it is surrounded. Hence a considerable degree of motion is readily permitted between the neck of the sac and the hernial aperture in the abdominal walls. If under these circumstances the hernia become strangulated by the neck of the sac, and reduction be attempted by manual pressure, the filamentous connexions of the sac may possibly be overcome, and the entire mass, still strangulated, pushed within the abdomen.

The situation occupied by the tumour within the abdomen is subject to considerable variation. Frequently the sac is lodged immediately behind the aperture through which it has receded. Sometimes it has proceeded towards the cavity of

the pelvis, and occasionally towards the crest of the ilium. In a case related by Arnaud, the neck of the sac remained in the vicinity of the ring, whilst its base was inclined towards the bladder. More frequently the mouth of the sac is that part of it which is placed most remotely from the ring. In one case, reported by Arnaud, the mouth of the sac was directed towards the rectus muscle; in another it rested upon the psoas.

The accident has been known to occur in cases both of femoral and of inguinal hernia. Of the latter it has been found most frequently in the oblique variety.

2. *Symptoms of the accident.* — The signs and symptoms of hernia when reduced in mass are generally sufficiently clear to indicate its occurrence to the surgeon who is duly impressed with the nature of the accident, and who devotes himself seriously to the examination of the case. Arnaud describing the signs of this false reduction remarked, that the tumour returns all at once, and as it were “in a lump;” the surgeon neither being sensible of that successive and gradual diminution of size which is usually observed in the perfect reduction, nor of the rumbling or gurgling noise which generally attends an enterocele when released from strangulation. These circumstances, conjoined with the persistence of the symptoms of intestinal obstruction, are sufficient grounds for entertaining a strong suspicion that the hernia has been reduced in mass. His suspicion will receive strong confirmation by the following symptoms and external characters, namely: a large, unoccupied, and well-defined hernial aperture; a distinct and isolated state of the spermatic cord, — supposing the hernia to have been inguinal; a firm tumour within the abdomen in the vicinity of the ring, and pain especially concentrated in this part of the abdomen. When these signs co-exist with the circumstances already noticed, they must be regarded as strongly corroborative of the suspicion. But although their

presence is of great affirmative value, their absence does not, however, amount to a negation of the accident, as will appear from the following observations.

If the hernia which has been reduced is of the inguinal species, the presence of the sac, in conjunction with the cord, causes the aperture to be somewhat occupied and obscured, and the cord itself to be apparently enlarged and ill-defined; its constituents being difficult of recognition: whereas, if such a hernia has been reduced in mass, the ring is generally unoccupied and patent, its margins are well-defined, and the cord is distinct and isolated. But this condition is sometimes only temporary. After the lapse of a few hours or days, effusion may take place in the lacerated filamentous tissue in which the hernial sac was formerly lodged, and cause more or less swelling; the ring may thus be occupied, the cord obscured, and the presence of the sac simulated. In one of Mr. Luke's cases the ring was entirely free from any appearance of tumour on the fourth day after the reduction of the hernia; but on the eighth day tumefaction had arisen in the course of the inguinal canal, from the infiltration of a quantity of highly offensive sanious fluid.

A firm tumour within the abdomen, in the vicinity of the ring, has frequently been stated by surgical writers as one of the signs of this accident; and, when such a tumour can be detected, it must undoubtedly be regarded as a sign of great value. But it must not be supposed from this, that in all cases an abdominal tumour can be detected by manual examination. When we consider the loose and yielding character of the subserous tissue at the lower part of the abdomen, we can readily imagine that a firm tumour, such as that which is formed by the strangulated mass and its sac, would recede under the pressure of the surgeon's hand, or even by a similar pressure from the action of the abdominal muscles. Such a change of situation actually occurs in some cases; and at one period a tumour may be readily detected within the

abdomen, whilst at a subsequent examination, even in the same case, the tumour may be no longer perceptible. Mr. Luke states, that on examining a man who had reduced in his own person an inguinal hernia in mass, a tumour was obscurely felt in the situation of the internal ring, somewhat rounded on its surface, but not well defined. When pressed upon, it receded more deeply within the abdomen, and at a subsequent examination it could no longer be felt. Pain in the abdomen confined to the neighbourhood of the ring, although a frequent, is far from being an invariable, attendant on hernia when reduced in mass. Cases have occurred in which the patient did not complain of the slightest pain, or of any tenderness under pressure.

If, after duly considering the various signs already enumerated, the surgeon feels that not merely a strong suspicion, but even a fair presumption of the occurrence of the accident exists in his mind, he is then justified in removing all doubt by resorting to what Mr. Luke has named an *exploratory examination*. This is done by exposing the ring by incision, and laying open the layer of filamentous tissue in which the hernial sac either is, or has been recently, lodged. If it be now ascertained that these structures are occupied by an empty hernial sac, the evidence is conclusive that the hernia has not been reduced in mass; but, on the contrary, if no hernial sac be found, and there is no doubt of the previous existence of hernia, the accident becomes at once apparent. In this case, on passing the finger through the ring or canal into the abdomen, and moving it from side to side, the firm, rounded, resisting mass, formed by the sac and its strangulated contents, will be found lying unattached, except by its neck, within the abdominal walls, but yet external to the general cavity of the peritoneum. This mass, when felt by the finger, does not afford the same yielding sensation which is produced on feeling a distended portion of intestine covered by the peritoneum, even when the latter still retains its filamentous connexion with the abdominal walls.

3. *Treatment*.—Although an instance has been recorded of a spontaneous cure of this accident, yet the probability of such a favourable occurrence is so extremely slight, that it must on no account be relied upon. The existence of reduction in mass having then been unequivocally established, it is the imperative duty of the surgeon to attempt the relief of the patient by operation.

The exploratory examination may be regarded as the first stage of the operation. The subsequent steps consist in causing the strangulated parts to descend whenever it is practicable, and then in opening the sac and releasing the viscera from strangulation, and treating them upon the principles which are laid down for guidance in the operation for strangulated hernia. (P. 131 *et seq.*)

The descent of the strangulated mass with its sac has been sometimes accomplished by directing the patient to cough, and to make propulsive efforts: but this is not likely to succeed generally, unless the mass be partially lodged within the inguinal canal, in which case the reduction in mass can scarcely be regarded as having been complete. In most instances it will be found necessary to enlarge the ring by incision, so as to allow the parts to descend. In this part of the operation, regard must be had to the situation of various blood-vessels. If the hernia be inguinal, the incision of the ring and of the neighbouring portion of the abdominal walls must be directed upwards, or parallel to the linea alba. If it be femoral, the incision should be made in an oblique direction, and commence from the middle of the anterior border of the femoral ring towards the umbilicus. By thus directing the incision in the case of femoral hernia reduced in mass, the epigastric artery is avoided; but, in spite of every precaution, there must always be incurred some risk of wounding the obturator when it pursues an irregular and dangerous course. The incision, however, which is requisite for allowing the descent of the strangulated mass, would at the same

time afford the necessary facility for exposing and securing the wounded obturator artery. If the operation for femoral hernia reduced in mass be performed in the male, the spermatic cord should be previously exposed by incision and elevated, so as to secure it from injury during the incision of the femoral ring.

The dilatation of the hernial aperture being effected, the patient may be directed to make a propulsive effort. If this should not succeed in causing the tumour to descend, the sac may be seized with blunt forceps, and a gentle effort made to draw it down. But, should the resistance to its descent be considerable, a further dilatation of the ring may be deemed advisable; after which, if the tumour cannot be made to descend, the sac must be cautiously opened, when, from the escape of serum, the size of the tumour will frequently be so far diminished as to allow of the parts being readily drawn down by the forceps or fingers, after which the stricture must be divided in the usual way. In some instances, however, all these attempts may fail to cause the hernia to descend. In this case, it will be necessary, after opening the sac, to divide the stricture within the abdomen. In doing this, the hernia-knife must be cautiously conducted along the finger, with the flat surface of the blade in contact with it all the way, until it is insinuated within the stricture. In such a case as this, the sheathed bistoury devised by Mr. B. B. Cooper, or that by Mr. Turner, would be of great value, and would conduce greatly to the safety of the patient.

In the cases treated by Arnaud, he opened the sac and divided the stricture within the abdomen. In one case, the stricture was situated so far from the ring that he experienced very great difficulty in reaching it.

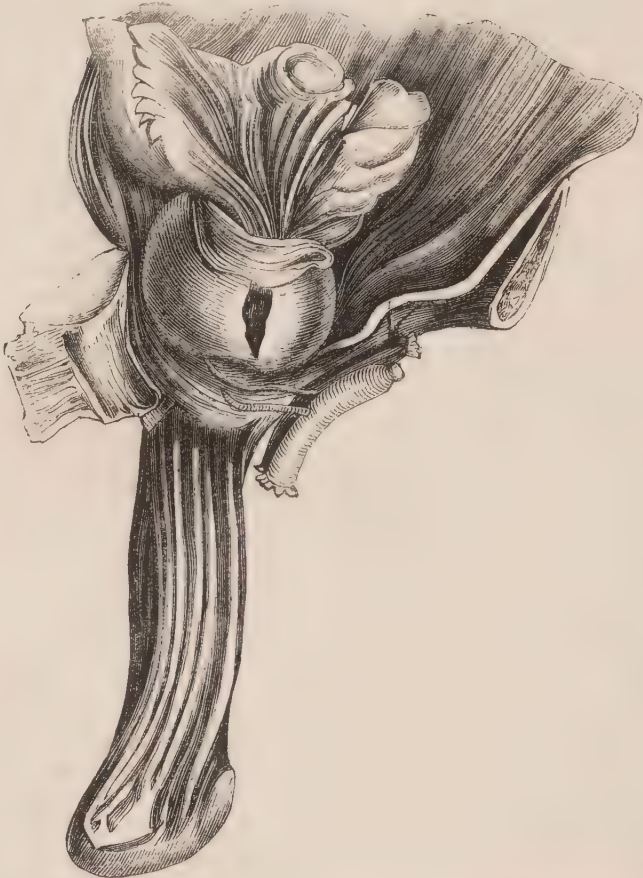
Dupuytren in two cases, and Mr. Luke in one, after enlarging the ring by an incision, succeeded in drawing down the tumour, and then dividing the stricture.

TABLE EXHIBITING THE LEADING FEATURES OF SEVERAL RECORDED CASES OF HERNIA REDUCED IN MASS.

Reference.	Sex and age of patient.	Species and character of hernia.	Treatment and result.	Remarks.
Arnaud, Diss. on Hernia, p. 370.		Femoral, size of a hen's egg; 12 hours after strangulation reduced, but returned during the two following days when the patient coughed, and sometimes it went up of itself with ease; for several days it no longer descended.		Death on the 9th day: on dissection, the tumour was found situated between the peritoneum and the insertion of Poupart's ligament.
Arnaud, p. 371.	Male æt. 40.	Right inguinal hernia, 7 or 8 inches long; reduced by taxis, symptoms not relieved. The hernia had been easily reduced, the ring was very wide; on plunging the finger into it, the resistance of a very hard tumour was felt. By the patient forcing downwards, the tumour became more perceptible to the touch.	Operation.— Ring exposed and incised "pretty deeply;" sac opened within the abdomen; unsuccessful attempt to draw down the tumour. Being unable to reach the neck of the sac, Arnaud made a further incision of the ring; after which he reached the orifice of the sac, and divided the stricture with a probe-pointed bistoury guided along the finger.	The tumour ran along the rectus as far as within two fingers' breadth of the navel.
Vacher. — Arnaud's Dissert. p. 387.	Male, æt. 50.	Inguinal.— Six months before had hernia reduced by taxis; subsequent colics; symptoms of ileus. Death.		Sac situated behind the ring of the external oblique; its base inclined towards the bladder, its mouth adherent to the ring.
Vacher. — Arnaud's Dissert. p. 386.		Inguinal—strangulated; operation, sac opened, ring incised, but stricture at neck of sac undivided.— Death.		On dissection the mouth of the sac was found situated upon the psoas muscle.
Arnaud, p. 391.	Female.	Femoral—strangulation; operation, no relief. Thirty-six hours afterwards, Arnaud was consulted, and passing his finger deep within the wound felt a hard tense tumour.	Not being able to make the tumour descend, Arnaud passed his finger up to the orifice of the sac, which was situated three inches deep within the abdominal muscles towards the ilium, and divided the stricture formed by the sac by a probe-pointed bistoury conducted along his finger. Recovery.	

Reference.	Sex and age of patient.	Species and character of hernia.	Treatment and result.	Remarks.
Arnaud, p. 408.	Male, æt. 18.	Inguinal — which had existed from birth—as large as a turkey's egg. Arnaud reduced it with great ease, but it immediately returned. It was reduced a second time, and again returned without any change of size or hardness. It was reduced a third time, and, being followed by the finger, was felt within the abdomen as hard as ever.	From the description given of the case, it appears (though not very distinctly) that the tumour again descended. An operation was performed, the sac opened, and the stricture formed by its neck divided. Recovery.	
Vignière. — Dict. des Sciences Médicales, art. Bubonocèle, p. 375.			Not able to cause the hernia to re-appear by coughing, M. Vignière exposed and incised the ring, and seizing the sac brought it down, opened it, and divided the stricture formed by its neck. Recovery.	
Scarpa. — Wi-shart's Transl. p. 143.	Male, æt. 13.	Hernia reduced by taxis, symptoms unrelieved. — Death.		On dissection the hernia was found within the abdomen, strangulated by the neck of the sac.
Dupuytren. — Leçons Orales, t. iii. p. 545.	Female, aged.	Femoral hernia of many years' duration, strangulation, reduction by taxis, symptoms unrelieved. — Death.		On dissection the tumour was found lodged in the iliac fossa, above the femoral arch. On opening the walls of the abdomen, the tumour appeared to be covered by a double layer of peritoneum.

Reference.	Sex and age of patient.	Species and character of hernia.	Treatment and result.	Remarks.
Dupuytren. — Leçons Orales, t. iii. p. 553.	Male æt. 55.	Left femoral hernia of 28 years' duration ; strangulation. After many attempts at reduction, he was placed in the bath, when the tumour returned spontaneously — “d'elle même et tout d'un coup.” Obstruction continued.	Operation on the 12th day of strangulation. An incision was made over the femoral ring parallel to the axis of the thigh. Pubic portion of fascia lata being divided, the finger was pushed through the femoral ring into the abdomen, when an elastic body was felt above and behind the femoral arch. The crural ring being incised obliquely upwards and <i>outwards</i> (according to Dupuytren's usual practice in femoral hernia), the sac could be seen; and some masses of cellular tissue on its exterior being seized with forceps, it was drawn down a little, aided in its descent by the efforts of the patient in coughing. The sac being opened, the tumour was drawn still lower, and the stricture divided. Recovery.	
Dupuytren. — Leçons Orales, t. iii. p. 557.	Female, æt. 59.	Right femoral hernia of 12 years' duration, strangulated. Reduction by taxis; symptoms continued; inflammation of the parts where the hernia had been situated; suppuration; infiltration of cellular tissue; ulceration of skin; fecal fistula; subsidence of symptoms of obstruction. Recovery.		An instance of spontaneous cure.
Dupuytren. — Leçons Orales, t. iii. p. 561.	Male, æt. 59.	Right inguinal hernia of 23 years' duration; strangulation, reduction by taxis, symptoms unrelieved.	Operation.—Incision in the direction of the cord, along which the finger was passed to its posterior part, when a rounded, moveable, and moderately consistent body was perceived. Ring divided parallel to the linea alba; tumour seized with forceps, drawn down, and engaged in the ring; sac opened, and along with its contents drawn entirely outwards, when the seat of stricture at the neck of the sac was brought into view and divided. Death.	
Mr. B. B. Cooper. — Guy's Hospit. Reports, iv. 326.	Male, æt. 68.	Right oblique inguinal hernia, strangulated; reduction either spontaneously or by the patient. Tumour reproduced by coughing, and easily returned, but again descending on slight muscular efforts. It receded into the abdomen by the “most gentle pressure.” Death on the 5th day of strangulation.		<i>Remarks.</i> On dissection a small portion of intestine was found strangulated by the neck of the sac within the abdomen.

Reference.	Sex and age of patient.	Species and character of hernia.	Treatment and result.	Remarks.
Mr. B. B. Cooper. — Guy's Hospit. Reports, iv. 332.	Male, æt. 67. See fig.	Right oblique inguinal hernia of 30 years' duration. Reduction by taxis, symptoms unrelieved. Death.		On dissection the tumour was found lodged between right linea ileo-pectinea and bladder.
<p style="text-align: center;">Fig. 16 b.</p>  <p style="text-align: center;">Inguinal hernia reduced in mass. Guy's Hospital Museum.</p>				
Medical Gazette, i. 484.	Male, æt. 47.	Inguinal hernia of 20 years' duration. Reduction in mass, "with the greatest ease:" symptoms of strangulation continued; patient died in fourteen hours, having passed three motions with relief. "The hernia came down repeatedly during the day, and was each time reduced with great facility."	Death.	<i>Dissection.</i> — Hernia in the scrotum: it having descended immediately prior to death, the sac contained a fold of mortified gut. While the hernia was down, there was a fold of peritoneum like a loose bag hanging round the neck of the sac internally. On reducing the hernia, the gut, carrying before it the neck of the sac, entered the loose bag of peritoneum, but still remained external to the abdominal cavity.

Refer- ence.	Sex and age of patient.	Species and character of hernia.	Treatment and result.	Remarks.
Mr. Banner Prov. Med. & Surg. Journal Feb. 1843.	Male, æt. 42.	Inguinal hernia of many years' duration, size of an egg; strangulated two days. Reduced by taxis, symp- toms unrelieved; ring could be clearly felt; not the least appearance of tumour. Death.		On dissection the hernia was found strictured by the neck of the sac and ly- ing within the internal ring.
Mr. Luke. Med. Chir. Trans. vol. 26.	Male, æt. 50.	Right inguinal hernia of many years' duration; stran- gulation; reduced by pa- tient; symptoms of obstruc- tion continued. Death af- ter several days.		
Mr. Luke. — Ibid.		Oblique inguinal hernia; strangulation; reduction by patient. Death.		Tumour with- in the layers of the abdominal walls, external- ly to the gene- ral peritoneal cavity; base of sac below the level of ring, directed to- wards the pel- vis; stricture formed by the neck of the sac.
Mr. Luke. Ibid.		Similar to the former.		Similar to the former.
Mr. Luke. — Ibid.	Male, æt. 30.	Left oblique inguinal hernia of many years' du- ration; reduced by the pa- tient; obstruction and in- flammation followed; there was not any fulness of the abdomen in the neigh- bourhood of the ring, nor more pain on pressure on the left than on the right side. At the time of re- duction he "employed but very little force," and "the reduction was not attended by the slightest pain." On the 7th day after reduction, tumefaction was observed in the course of the ingui- nal canal.	Operation. — Incision made into the swollen part, followed by a discharge of sanious fluid; incision con- tinued to the internal ring, where a lustreless green membrane having a tense and rounded surface pre- sented itself. The sac being opened, the intestine was found sphacelated, and gave way under the pres- sure of the finger. The seat of stricture was so high as to be reached with great difficulty; its division was unnecessary, as there was a free fecal discharge. Death two days after operation.	The base of the sac was laid below the level of the ring di- rected towards the pelvis, the neck of the sac extending up- wards towards the umbilicus, and three or four inches dis- tant from the internal ring.

Reference.	Sex and age of patient.	Species and character of hernia.	Treatment and result.	Remarks.
Mr. Luke. — Med. Chir. Trans. vol. 26.	Male, æt. 40.	Left inguinal hernia; strangulation; reduction by the patient; after which a tumour could be obscurely felt in the situation of the internal ring, somewhat rounded on its surface, but not well defined. When pressed on, it receded more deeply within the abdomen, and was slightly painful. The tumour could not be made to descend again by coughing and straining.	Operation.—An incision three or four inches in extent was made over the inguinal canal, by which the tendon of the external oblique, the external ring, and the spermatic cord were brought into view. Inguinal canal exposed by incision of tendon of external oblique, and a layer of condensed cellular membrane opened, which was supposed to have formed the capsule of the hernial sac. A finger passed along the capsule entered the internal ring, the large, firm, and defined borders of which were perceptible. By pressing the finger a little more deeply within the abdomen, the rounded and tense surface of the tumour was readily detected, which after some little more exposure was seen to be dark-coloured. The internal ring being freely divided, the tumour was easily drawn down into the inguinal canal. The sac was opened, and the stricture formed by its neck divided. Recovery.	
Mr. Wade. — Lancet, Aug. 16th, 1845.	Male, æt. 75.	Old inguinal hernia, reduced in mass by the patient.	The patient being placed in the erect posture, after repeatedly coughing, the hernia protruded a little through the external ring. The inguinal canal was exposed by incision, the sac opened, and the stricture, situated at a distance of about three inches from the base of the sac, was divided.	Recovery.

CHAPTER XIII.

INTESTINAL FISTULA,

CONSEQUENT UPON GANGRENOUS OR WOUNDED HERNIA.

A PRETERNATURAL communication is occasionally established between a hernial portion of intestine and the exterior of the body. This condition may result from various causes: as, from an incision being made into a hernia which has been mistaken for an abscess; from the intestine being accidentally or designedly opened in the operation for strangulated hernia; or, from a gangrenous portion of the protruded intestine being detached by ulcerative absorption. To these unnatural openings the various terms *intestinal fistula*, *fecal fistula*, *accidental anus*, and *artificial anus* have been applied. The latter is not, however, indiscriminately applicable, and ought to be limited to those openings in the intestine which are designedly made for the relief of congenital or acquired obstruction of the bowels.

In the article "Fistula Intestinal," published in the *Cyclopedia of Practical Surgery*, the author has entered more at length into the different varieties of this affection, from whatever cause arising, than perhaps is desirable in a work exclusively devoted to the subject of hernia. It will be more particularly his object here to confine his observations to those varieties which are produced either directly or indirectly by hernial protrusions; and he avails himself of this opportunity of expressing his acknowledgements to the editor

and publishers of that work, for the kindness and promptitude with which they have allowed him to make use of such portions of that article as were necessary for his purpose.

When a strangulated hernia is abandoned entirely to the resources of nature, a powerful, and occasionally successful, effort is made to relieve the obstruction of the intestines. The protruded part mortifies; and, if the powers of the constitution are equal to the task, the other investments ulcerate, the dead portion of intestine is cast off, and the fæces escape. Although the natural efforts alone are sometimes capable of completing this process, yet more frequently the patient sinks exhausted, unless relief is obtained from surgical interference.

When, however, the intestinal contents have been evacuated, either spontaneously or by art, through an abnormal opening in the abdominal walls, the natural powers are still frequently capable of restoring the continuity of the alimentary canal, and of ultimately closing the external opening.

The various processes which thus conduce to the spontaneous relief of the serious consequences of obstruction and stricture in strangulated hernia, require now to be separately considered.

Spontaneous cure.—Highly important in the restorative operations of nature, is that provision whereby the separation of a gangrenous part of the body is generally preceded and accompanied by the adhesive process. This process is beautifully exemplified in the subject now under consideration. When a hernial portion of intestine loses its vitality from strangulation, the living parts of the tube bordering upon the gangrenous portion contract adhesions with the neck of the sac and the neighbouring portion of peritoneum. The edges of the opening in the intestine are thus united, through the medium of the neck of the sac, to the aperture

in the abdominal walls, and a barrier is thereby opposed to the effusion of the intestinal contents into the abdomen; and the sac, when it opens externally, forms a canal, continuous with the interior of the intestine, allowing the transit of feculent and alimentary matters from the latter to the surface of the body. In process of time, these newly adherent parts become, as it were, cicatrized; and the serous membrane of the sac appears continuous, on the one hand with the skin, and on the other with the lining membrane of the intestine, assuming, in function at least, some of the characters of a mucous membrane. Hence it is evident that, in the treatment of gangrenous hernia, it is of the utmost importance to avoid disturbing the adhesions which are in process of formation, and which tend so materially to secure the future safety of the patient.

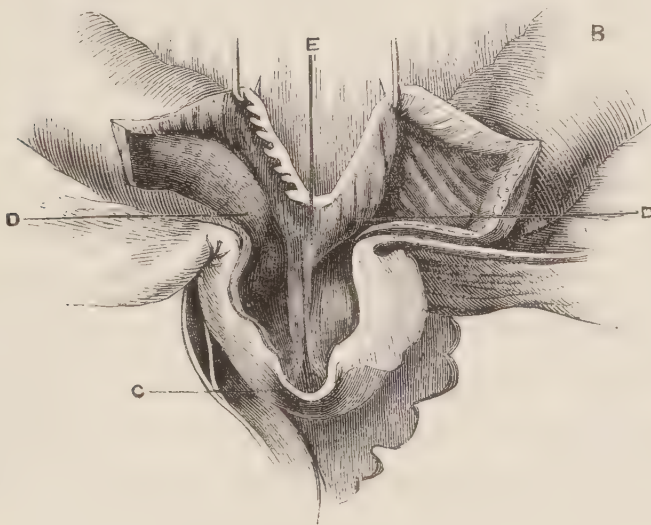
If the gangrene involve only a small portion of the wall of the intestine, the alimentary contents escape only in part through the sac, the remainder pursuing the natural course. When a larger portion of the tube, or an entire loop is removed, the whole of the contents usually, for some time, escape by the wound; but after a period, varying from a few days to several weeks, small quantities of feculent matter begin to pass by the anus: by degrees the discharges by the natural passage increase, and in the same ratio the evacuations from the wound diminish. It was formerly supposed that, when the intestinal contents were thus resuming their natural course, the two open extremities of the intestine became gradually turned towards each other, and at last were so opposed that the feculent matter passed directly from the superior into the inferior portion of the canal. The fallacy of this opinion has been ably exposed by Scarpa,¹³⁴ who has shewn that the apertures of the intestine which has been divided by gangrene, are “constantly placed in a parallel line to each other;” that the superior orifice is always kept in a state of dilatation by the passage of feculent matters;

and that it is likewise pushed outwards, or towards the wound, whilst the lower aperture has a constant tendency to diminish in size, and to retire within the cavity of the abdomen. The contraction of the external wound exerts no influence whatever in producing a movement of approximation of the two orifices; on the contrary, Scarpa has proved by the dissection of the following cases, that the restoration of the canal is accomplished by a totally different process.

A man,¹³⁵ twenty-two years of age, was brought into the hospital at Pavia with hernia of the tunica vaginalis of the left side. On opening the tumour, it was found to contain a small portion of omentum, and a long loop of gangrenous ileum, which was cut away after the stricture had been divided. The fæces escaped from the wound, and the sloughs separated. On the fourteenth day the fæces began to pass in part by the anus. On the twenty-fourth and twenty-fifth days, the patient, in consequence of irregularity in diet, was attacked by violent colic, which returned on the thirty-first day, when the wound dilated, and allowed of the discharge of a great quantity of feculent matter and several intestinal worms. On the forty-second day the wound was nearly cicatrized, and there were only discharged from it a few drops of feculent matter. In nine months, after eating immoderately of cray-fish imperfectly cleansed of their shells, he was again attacked with severe pains in the bowels, and in a short time died. On the body being opened, there appeared in the abdomen a copious effusion of fluid feculent matter, which had escaped from a perforation of ileum, through which some shells of cray-fish were seen hanging into the abdomen. The diameter of the ileum, for a considerable extent towards the stomach, was three times greater than natural; the lower portion of this intestine was evidently contracted, and its orifice drawn more inwards than that of the upper portion. The two divided portions of intestine *met together at an acute*

angle opposite to the abdominal ring. The angle of union was firm and compact, and still more so from the omentum being placed over the part and adherent to it. The corresponding portion of mesentery was also thicker and firmer than usual. After having removed the parts from the body, Scarpa found that the peritoneum in the neighbourhood of the ring was adherent to the portion of the intestinal tube which had been unaffected by the gangrene, and that it extended like a *membranous funnel* from the cavity of the abdomen through the aponeurotic ring into the fistulous tube which opened externally at the groin. There could be no

Fig. 17.*



Membranous funnel formed by the hernial sac. After Scarpa.

doubt that this membranous tube, extending through the inguinal canal, was the same which previously formed the hernial sac, since it was evidently a prolongation of the peritoneum. On laying open the ileum near to the mesentery, a probe was introduced into the small aperture in the

- * *a.* Upper portion of intestine.
- b.* Lower portion of intestine.
- c.* Hernial sac.
- d, d.* Edges of the opening in the intestine adherent to the neck of the sac.
- e.* Projecting ridge.

groin, as far as the membranous funnel, and from thence into the superior portion of intestine. Scarpa thereby ascertained the direct way which the feculent matter had taken when it was discharged from the wound. He then laid open longitudinally the external fistulous canal and the membranous funnel, and saw distinctly that "the two orifices of the intestine had remained in a direction parallel to each other and without being at all turned towards each other, and that a *ridge projected* between them, which alone would have been sufficient to prevent the direct entrance of the feculent matter from the superior into the inferior orifice. Therefore, as in this patient there was no doubt that after the fourteenth day the fæces had begun to resume their natural course, it was not difficult to comprehend that the alimentary matters had been poured from the superior orifice of the intestine, first into the membranous funnel formed by the remains of the neck of the hernial sac, then from this by a half-circle into the inferior orifice of the intestine. And it was precisely within this half-circle of the membranous funnel that the shells and claws of the cray-fish had been accumulated, and, by obstructing the communication between the two orifices of the intestine, had occasioned the rupture of the ileum above the union of this intestine with the remains of the neck of the hernial sac."

He also ¹³⁶ met with a similar arrangement of the parts in examining the body of a woman, who, for several years, had a fistulous opening in the groin, in consequence of a gangrenous femoral hernia. The protrusion appeared to have been small, implicating only a part of the cylinder of the intestine. In this instance the two orifices were united at an obtuse angle, and were, as in the former case, "surrounded by, and included in, a membranous funnel, formed by the peritoneum, or the remains of the hernial sac." Water injected down the upper portion of intestine met with considerable resistance in its passage ; and, precisely at the angle of union

of the two portions of intestine, the injected fluid was observed to make a half-circle within the femoral arch, and to distend the integuments at the groin before entering the lower orifice of the intestine. Scarpa observes, that nothing could be more evident than that the great peritoneal sac extended under the femoral arch to form the membranous funnel, of which the base included the two orifices of the intestine, and the apex was lost in the narrow fistulous tube remaining in the bend of the thigh. On dividing longitudinally the fistulous tube and the membranous funnel, the two orifices of the intestine appeared, still more distinctly than in the preceding case, to be united together laterally at an angle, in such a manner that the inferior orifice was placed a little more behind, and lower than the superior. The ridge projecting between the two orifices was neither so complete nor so prominent as in the subject of the preceding observation, nor such as to intercept all direct communication between the superior and the inferior portions of the ileum. But this direct passage was so narrow, that even pure water, forcibly injected, did not dilate the contracted passage, but descended from the superior orifice into the membranous funnel, and then returned to the lower orifice of the ileum.

Mr. Travers,¹³⁷ whose valuable work every surgeon should carefully study, has also shewn by experiment, that “the peritoneal surface is essential to the restoration of an intestine of which a part has been disorganized by stricture.”

From these observations it is evident that the continuity of the intestinal canal is not restored by a direct union of the divided portions of intestine, but indirectly through the medium of the hernial sac; that the sac constitutes a funnel-shaped membrane, embracing the two openings of the intestine by its base, and prolonged by its apex through the aponeurotic opening of the abdominal wall into the fistulous canal in the integuments; and that the feculent and alimentary matters are first poured from the upper portion of the

intestine into the membranous funnel, and thence into the lower orifice of the intestine; and that the two divided portions of intestine unite at an angle, which forms a valvular ridge or projection, and more or less completely obstructs the direct passage of the intestinal contents from the upper to the lower portion of the tube.

As the process of restoration advances, the divided portions of intestine, the angular projection, and the adherent neck of the sac become gradually retracted within the abdomen, and the injured portion of intestine regains a certain degree of mobility. In one of the cases, examined by Scarpa¹³⁸ several years after the operation for hernia, the orifices of the intestine, with the neck of the sac adherent, were drawn several lines from the femoral arch; and Dupuytren¹³⁹ states that he has found the intestine loose in the abdominal cavity, and not directly adherent to the walls, but connected to them by a fibro-cellular cord, which constituted the sole remnant of the adhesions formerly uniting them.

Various agents are supposed to assist in producing this retraction. The intestinal contents in passing over the projecting ridge act upon it, and gradually diminish its prominence, pushing it back with a force proportioned to the resistance which they experience to their escape through the narrow wound in the abdomen. The peristaltic movements, and the more extensive undulations of the entire canal, are supposed by M. Dupuytren¹⁴⁰ to contribute to the loosening and elongation of the adhesions, which connect the opened part of the intestine to the surface of the cavity. A third circumstance, even more powerful than the former, co-operates with them in producing these effects. The mesentery connected with the opened portion of intestine is stretched and thrown into folds between its lumbar attachment and the bowel. In many cases of hernia this extension of the mesentery is so considerable as to keep the body bent forwards;

and in abnormal anus this mesenteric cord is constantly drawing the intestine towards the cavity.

As the intestine becomes retracted within the abdomen, the adherent neck of the sac is drawn with it; and the funnel-shaped cavity which it now constitutes, and which separates the ridge from the opening in the walls, is extended. Thus the intestinal contents find, in front of the ridge, a space gradually becoming larger, through which they have a more easy passage from the upper to the lower part of the intestine; they are at the same time directed with less force towards the external opening, and thus in many instances the wound of the integuments is frequently allowed to contract, and ultimately to close.

The following table exhibits eleven recorded cases, taken indiscriminately, in which the feculent discharge following gangrenous hernia spontaneously ceased. In eight of these cases, the time when the cessation occurred is specified, and is found to vary from thirteen to seventy days; or, on the average, to be thirty-nine days. Some further lapse of time was requisite for the perfect cicatrization of the wound. This accords with the result of numerous cases which have fallen under my own observation.

The quantity of intestine destroyed is not in all the cases noted; but in some of them the gangrene must have implicated a few inches of the tube; and in the instance related by Scarpa a long loop of intestine was lost.

TABLE

EXHIBITING ELEVEN CASES IN WHICH THE FECULENT DISCHARGE
FOLLOWING GANGRENOUS HERNIA SPONTANEOUSLY CEASED.

Reference.	Extent of intestine destroyed.	Duration of feculent discharge.
Petit, Trait. des Méd. Chir., p. 299.	Incision 1 inch in the mortified intestine.	In 13 days fæces ceased to pass by the wound.
Gooch, Works, vol. ii. p. 197.	Incision 2 or 3 inches long in the mortified intestine.	In 10 weeks fæces ceased to pass by the wound.
Travers, Inquiry, &c., p. 317.	Free opening made in the mortified gut.	Fæces generally took their natural course in 6 weeks, and in 11 weeks the wound was healed.
Scarpa, Wishart's Tr., p. 301.	Long loop of sphacelated ileum cut away.	On the 42d day the wound was nearly cicatrized.
Petit, Traité des Méd. Chir. p. 317.	Intestine and scrotum gangrenous. Free incision.	Fæces ceased to pass by the wound on the 28th day.
Petit, Traité des Méd. Chir. p. 321.	Intestine freely opened by gangrene.	On 19th day fæces ceased to pass by the wound, which was nearly healed on the 22d day.
Louis, Mém. de l'Acad. de Chir. t. iii. p. 199.	Intestine and integuments extensively gangrenous.	Fecal discharge from the wound ceased in one month.
Pousardin, Mém. de l'Acad. de Chir. t. iii. p. 203.	Intestine gangrenous ; integuments opened by ulceration.	Fecal discharge ceased in 6 weeks.
Pousardin, Mém. de l'Acad. de Chir. t. iii. p. 203.	Intestine gangrenous ; sac filled with feculent matter.	Fecal discharge ceased in 2 months and a half.
Lanzoni, Mém. de l'Acad. de Chir. t. iii. p. 204.	Small loop of intestine gangrenous.	Wound cicatrized in 20 days.
Cooper, 2d edit. p. 572.	Incision $1\frac{1}{2}$ inch long in gangrenous intestine.	Wound healed in 11 weeks.

In operating for strangulated hernia, the surgeon occasionally observes the intestine to be congested or inflamed, but in such a degree as not to preclude the hope of its resuming a healthy condition. He returns the bowel into the abdomen, and, in a few days, feculent matter escapes at the wound. After a time the discharge of fæces generally ceases, and the wound cicatrizes. The subjoined table exhibits seven cases of this description. It will be seen that in six the discharge appeared at the wound at periods varying from the third to the fifteenth day, or, on the average, on the eighth day; and in one instance it did not occur until the forty-second day. In four the discharge continued only from three to twenty-one days; in one, seventy-seven days; and, in the case where the discharge first appeared on the forty-second day, death occurred ten days afterwards. The duration of the discharge in these cases is, as might be expected, considerably less than in those of the former table, in which the destruction of intestine was more considerable.

CASES OF FECAL FISTULA SUBSEQUENT TO THE RETURN OF THE
INTESTINE INTO THE ABDOMEN.

Reference.	Time when the fecal discharge commenced.	Duration of fecal discharge.
Sir A. Cooper, 2d edit. pt. i. p. 47.	10th day after operation.	Wound healed in 11 weeks.
Cooper, ditto.	15th day after operation.	Feculent discharge ceased in 3 weeks.
Cooper, ditto.	5th day.	Fæces escaped only during 3 days.
Key, Memoir, p. 112.	3d day.	Discharge of fæces continued 5 days.
Key, ditto.	4th day.	In 16 days the wound had closed.
Lawrence, 5th edit. p. 328.	42d day.	Death 10 days after.
Le Dran, Lawrence, p. 350.	11th day.	Patient recovered.

Failure of spontaneous cure.—The restorative operations described above may be interrupted in different stages of their progress, by imperfection or disturbance of the adhesive process—by insufficient retraction of the valvular projection—or by premature closure of the external wound.

The adhesive process may fail from defective deposition of organizable lymph; it may be disturbed by the officious hand of the surgeon; and Dupuytren has known the newly-formed adhesions to be destroyed by the dragging of the mesentery being excessive. The injurious consequences of failure or disturbance of the adhesive stage are fatal feculent effusions into the peritoneum.

The retraction of the divided portion of the intestine, and of the intermediate projecting valve, is sometimes insufficient to allow of the continuity of the intestinal tube being restored. This incomplete retraction may result from defective operation of those causes which have been shewn to obviate or overcome the resistance afforded by the projecting valve. Thus, the pressure of the intestinal contents against the valve may be defective, from the large size of the external aperture permitting their unopposed escape. The retractive influence of the mesentery may be deficient from the long and relaxed condition of this structure; or it may be counteracted by the injudicious employment of ligatures, for the purpose of confining the divided extremities of intestine to the neighbourhood of the wound. The ligature is in this case not only injurious, from opposing the retraction of the mesentery, but also from dragging it outwards, and thereby increasing the prominence of the projecting ridge. It may also be the cause of subsequent mischief, by producing more extensive adhesions than are necessary for the mere prevention of feculent effusion. From incomplete retraction of the projecting ridge, the tendency to permanent fecal fistula is greatly increased.

Premature closure of the external wound may produce in-

testinal obstruction, feculent effusion into the peritoneum, or infiltration of fæces in the integuments, followed by abscesses and sinuses. It is, therefore, important that the surgeon should not be too solicitous to close the external wound, by pressure or other means, until he has reason to believe that the contents of the alimentary canal have acquired an easy passage from the upper to the lower part of the intestine. From premature contraction of the external wound symptoms may be produced not unlike those which attend strangulated hernia. The patient from this cause may be attacked with acute pain in the situation of the fistula, tension of the abdomen, vomiting, hiccup, and general prostration of strength; and, if relief be not speedily obtained, rupture of the intestine, feculent effusion, and death may follow.

ANATOMICAL CHARACTERS OF INTESTINAL FISTULA.

When the natural efforts fail in restoring the continuity of the intestinal canal, if life be preserved, permanent fecal fistula, or abnormal anus, is produced. In this condition, the intestinal contents may escape entirely, or in part, by the accidental opening; or the aperture may be so small as only to allow of the occasional discharge of liquid feculent matter, or a little mucus. The discharge from the adventitious opening is always involuntary, as there is not a sphincter muscle to control it. The aperture is generally rounded, sometimes irregular, varying considerably in size, being sometimes an inch or more in diameter, and occasionally so small as scarcely to admit a probe.

M. Bourguery has represented, from the collection of Dupuytren, a case of intestinal fistula, in which the two portions of intestine terminated *on the cutaneous surface* by separate orifices.

Sometimes there are several small fistulæ communicating with the intestine. The surrounding integument is generally indurated, thickened, inflamed, and excoriated. Within the

opening, the mucous membrane of the intestine may often be seen tumid and of a bright red colour. If the external aperture be large, the two openings of the intestine, and the partition separating them, may be seen. "One of these orifices," says Dupuytren,¹⁴¹ "belongs to the upper part of the bowel; and, from being constantly permeated by food and fæces, is the larger of the two. The other, or the opening of the lower intestinal extremity, receives no alimentary or fecal matter, or only a small quantity; it is contracted, narrow, and with difficulty discovered. Beyond these orifices are the two extremities of the intestine, of which they constitute the termination; these pass back into the abdomen, and are lost among the convolutions of the canal.

"Between the two orifices, an angular fold, of greater or less projection, is placed edgeways. Formed by the intestinal coats towards the mesentery, the ridge comes nearer to the skin, in proportion as the loss of intestinal substance has been more considerable, and the change in the direction of the canal more marked. It is slight, and concealed in the depth of the funnel, when the intestine has been simply opened by a wound or a small mortification. It is very large, and advances to the level of the skin, when the whole circumference of the bowel has been destroyed, so that the two ends meet at an acute angle. In the first case, there exists between the two ends of the bowel a channel more or less deep, capable of conveying the contents from the upper to the lower end: this is the kind of intestinal fistula most easily cured. There is no vestige of such channel in the second instance; the projecting ridge, placed between the two ends of the intestine, forms an impassable barrier between them; here the cure is more difficult.

"The ridge, although placed between the two ends of the bowel, does not divide the bottom of the funnel equally; or, if this should be the case at first, the division becomes unequal subsequently. Being fleshy and moveable, it is

turned aside by the stream of matters coming through the end corresponding to the stomach, and pushed toward the anal extremity, contracting it, and acting as a kind of valve, which sometimes entirely shuts it. Hence the difficulty so often experienced of discovering the lower or anal orifice of the bowel."

Mr. Lawrence, ¹⁴² in his valuable treatise on Ruptures, observes that "the two portions of the bowel lie near together, but are not adherent; they are separated by the ridge called by Scarpa *promontorio*, and by the French *éperon*. If we introduce a finger into each orifice, and bring the fingers together, they are separated merely by the sides of the two portions of intestine. When it is described that they are kept apart by an intervening partition, we must remember that there is nothing but the intervening tunics. We might pass an instrument from one end of the bowel into the other, and thus cause a direct communication between them, by perforating their coats; but, as the bowels are simply contiguous without adhering, we should make a double wound into the cavity of the abdomen."

The two extremities of the intestine, at first resembling each other, soon exhibit striking differences. The superior portion, stimulated by the transit of fecal and alimentary matters, not only maintains its natural size, but becomes thicker and stronger. The inferior orifice, on the contrary, having ceased more or less completely to perform its natural functions, becomes atrophied to such a degree, that when the parts are examined, after the morbid condition has existed several years, it would, as M. Dupuytren has remarked, be difficult to suppose that the two portions of the intestine belonged to the same individual. Notwithstanding this change which takes place in the coats of the lower portion of intestine, it still generally remains pervious, and its lining membrane continues to secrete a whitish viscid mucus, which may remain in the canal for months or years

without acquiring a feculent odour. The following case recorded by M. Dupuytren, however, shews that obliteration of the lower portion of the canal is not impossible. An old man, ¹⁴³ a patient of M. Begin at the Val-de-Grâce, had, for more than forty years, at the left groin, an abnormal anus formed on the transverse arch of the colon. The superior opening of the intestine only could be detected. No opening corresponding to the inferior extremity could be discovered at the wound, in the cicatrix, or in the surrounding parts. The lower portion of intestine, resembling a solid white cord of the size of a goose-quill, ascended to the left kidney, and afterwards, forming some turns, descended to the anus. At the lower part it was still open, and contained whitish mucus. Above, it was so contracted as only to admit a small probe; and still higher, in the neighbourhood of the accidental anus, no trace whatever of an internal cavity could be discovered.

A drawing in Dupuytren's collection, represented in the work of M. Bourguery, exhibits an instance of intestinal fistula, in which the lower aperture was perfectly closed by the projecting valve.

EFFECTS OF INTESTINAL FISTULA.

The intestine, in the lesions now under consideration, being diverted from its natural course, restrained by adhesions, and perforated, is usually in a condition unfavourable for the perfect performance of the function of assimilation. The transit of aliment is often accelerated, and its course shortened; consequently, the changes essential to a healthy digestion are imperfectly performed, and the surface for absorption is often too limited for maintaining the nutrition of the body. Hence intestinal fistula is more dangerous in proportion as the opening maintains a greater proximity to the stomach. If the accidental anus be seated in the jejunum, the matters voided are not fetid, and the patient usually dies in a few days or

weeks from inanition. When the opening is in the ileum, nutrition is generally less seriously affected; and, if it be situated at the lower part of this intestine, a tolerable degree of health is sometimes maintained. In this condition the evacuations, having been longer retained, and subjected to greater changes, have acquired a somewhat feculent odour. When the large intestine is the seat of the injury, the health may remain perfect, and persons have been known to acquire a considerable degree of corpulency during the existence of intestinal fistula of the colon.

The injurious effects of intestinal fistula, even when situated in the upper part of the canal, are much mitigated when the escape of alimentary matters through the abnormal opening is only partial. In this case nutriment may pass into the lower portion of the intestine in sufficient quantity to support life, until the process of spontaneous cure is completed. The interference of art may also modify the injurious influence of a fistula at the upper part of the small intestine, provided the continuity of the canal be not entirely interrupted. Thus moderate external pressure may sometimes prevent the escape of nutriment, and direct it into the lower portion of the tube; but, in doing this, constant attention should be given to the injurious effects which sometimes result from undue pressure. The serious consequences of inanition may also be retarded, and sometimes altogether averted, by the use of nutrient clysters.

COMPLICATIONS OF INTESTINAL FISTULA.

a. Prolapse.—As the orifice of an intestinal fistula is not guarded by a sphincter muscle, it frequently allows the intestine to protrude, and to form a tumour, which greatly aggravates the sufferings of the patient.

At the commencement, the tumour appears as a slight projection of the mucous membrane of the intestine, of a red colour, occupying the abnormal opening. Subsequently, it

increases in size by the further protrusion of the everted intestine. Desault has observed it nine inches in length; Sabatier¹⁴⁴ refers to cases of greater magnitude; and Schacher¹⁴⁵ has described a protrusion of the colon which measured sixteen inches. The size is subject to variation from position; after the recumbent posture has been maintained for several hours, the tumour is generally diminished in size, and sometimes altogether disappears. Its growth is usually gradual; but under violent muscular efforts, as coughing, or straining, it may suddenly attain considerable size. The tumour is generally of an elongated and slightly tortuous form, contracted at its attachment, and perforated at its free extremity. It is constituted externally by the everted mucous membrane of the intestine, which is of a red colour, and has a low degree of sensibility; and is moistened by a secretion of mucus, and, when strongly constricted, even by an oozing of blood. The surface is sometimes wrinkled, from the presence of the valvulæ conniventes, and occasionally exhibits numerous small tubercles, which are the solitary glands in a tumid state. Sometimes the tumour exhibits obscure vermicular or peristaltic movements.

Protrusion of the intestine may commence within a short period of the establishment of fecal fistula. Sir Astley Cooper has observed it in one month from the occurrence of gangrenous hernia. In a case recorded by Scarpa, prolapse did not occur until three years had elapsed. In the latter instance the abnormal aperture had been reduced to the size of a small fistula.

The protrusion may occur at the upper, or at the lower opening, or at both orifices.

Prolapse at the superior aperture is the most frequent, and usually attains the greatest magnitude. It is easily recognised by the alimentary matters escaping from the opening at its free extremity. Mr. Lawrence gives the following description of this affection in a man sixty years of age, who

had voided the fæces entirely through the groin seventeen years. “ The projecting part was four inches long when I saw him; and the basis, which is the largest part, measured nearly six inches in circumference. This prolapsus never recedes entirely, but is sometimes considerably smaller. It has occasionally protruded to the length of eight or ten inches, being at the same time equal in size to the fore-arm, and bleeding copiously. This is attended with great pain, and only happens when the bowels are much disordered. Warm fomentations, and a recumbent position, relieve in this case, by causing the gut to return. The prolapsus is of an uniform red colour, similar to that of florid and healthy granulations. The surface, although wrinkled and irregular, is smooth, and lubricated by a mucous secretion. It feels firm and fleshy, and can be handled without exciting pain: it approaches on the whole to a cylindrical form; and its anterior loose extremity, which is of a circular figure, contains a roundish depressed opening, through which the stools are voided. The basis of the swelling is continuous on all sides with the integuments, and I could discover no opening of the lower end of the gut.”

β. *Prolapse of the lower orifice* of the intestine is usually of smaller size, and is known by the opening at its free extremity only giving exit to mucous secretions; the fecal matters discharged from the orifice of the upper portion of intestine making their appearance near the base of the tumour.

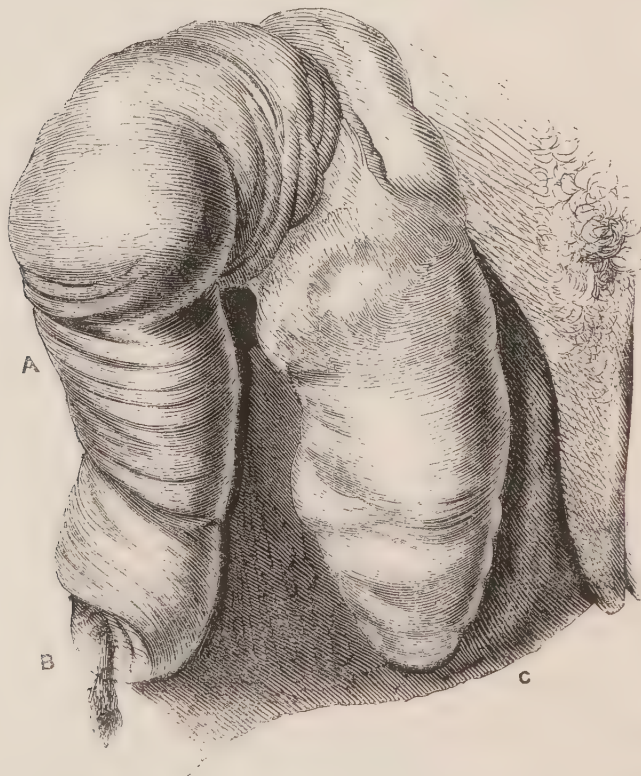
Sabatier, in an interesting memoir, has described the case of a soldier, who had a fistulous opening at the right side, communicating with the intestine, and allowing a partial escape of the fæces. After this accidental aperture had existed a year, he was seized with colic, and, being obliged to go to bed, found at the wound a red tumour, equal in size to a small nipple, which increased rapidly to the size of a fist. The prolapse afterwards varied much in size, but was ordinarily about six inches long, and one and a-half in diameter,

and exhibited very clearly the folds and glands of the intestine. It was not painful. The fæces flowed constantly from its basis in a fluid state, without the patient being conscious of their discharge. Small hard lumps, resembling fat in appearance, were occasionally expelled from the rectum. The patient enjoyed a good state of health, and was tolerably lusty and strong.

The same author has also related another example of prolapse occurring at the inferior opening.

γ. Prolapse at both orifices is occasionally observed. In this case, the peculiar character of the excretions voided by the two tumours, or the excretion of alimentary matters from one tumour, and the absence of such excretion from the other, readily determine which respectively belongs to the

Fig. 18.*



Intestinal fistula with double prolapse. From Bourgery.

* *a.* Prolapse of the upper portion of intestine. *b.* Aperture of ditto. *c.* Prolapse of the lower portion.

upper or to the lower opening in the intestine. Sir Astley Cooper represents this double protrusion in the second plate of the first part of his work on hernia. The accompanying illustration (fig. 18) is taken from Bourgery's work. Two interesting cases of this affection are quoted by Mr. Lawrence, from Albinus and Sabatier.

δ. *Effects of prolapse.*—Obstruction to the passage of alimentary matters from the upper to the lower portion of the intestine is a frequent result of prolapse. In cases where the evacuations have in part been discharged by the natural passage, in proportion as the protrusion increases, the natural evacuations diminish, and at length become entirely interrupted. Hence it is evident, that, in our attempts to restore the continuity of the alimentary canal, it is highly important to guard against the occurrence of prolapse. When the protrusion is great, painful dragging sensations in the abdomen are experienced; and the patient is sometimes involuntarily compelled to incline the trunk forwards. Although intestinal fistula complicated with prolapse has been shewn to be occasionally compatible with continuance of life and tolerable health, yet it may be stated as a general rule, that this complication aggravates all the inconveniences resulting from intestinal fistula; nutrition is more seriously disturbed, emaciation proceeds more rapidly, and the unfortunate patient is more liable to sink from inanition.

ε. *Causes of prolapse.*—The weakened state of the abdominal walls at the site of the abnormal opening, and the absence of the sphincter muscle to protect it, are the principal predisposing causes of the affection. Undue action of the respiratory muscles, in coughing, straining, or other violent efforts, is the general exciting cause.

ζ. *Changes of organization in the prolapsed part.*—The dense resisting cicatrix, which bounds the abnormal opening, exerts more or less constricting influence upon the protrusion, by which a congested state of the minute vessels of the part

is produced. Hence the mucous membrane appears red and turgid, and the entire mass becomes thickened and indurated by interstitial deposition. Adhesions also occur which sometimes render the tumour *irreducible*. So great is the constriction in some instances that actual *strangulation* occurs.

Intestinal fistula complicated with hernia.—Internally the two divided portions of intestine, where they join each other at an angle, form a kind of pouch communicating with the general cavity of the abdomen. Into this bag the loose viscera are received, and under great pressure of the respiratory muscles sometimes form a hernial protrusion at the abnormal opening.

ACCIDENTS LIABLE TO OCCUR AFTER RECOVERY.

After intestinal fistula has closed, the patient frequently remains liable, from irregularities in diet, to attacks of colic and obstruction of the bowels; for, although the intestinal canal may have been sufficiently restored to allow of the passage of liquid matters, it nevertheless continues often reduced in size below its natural capacity, and is unable to transmit solid masses of undigested food.

In consequence of this diminished size of the bowel, solid substances are arrested at the part, and excite spasmodic or inflammatory affections. Hence it is found that those individuals who have recovered from intestinal fistula are peculiarly liable to attacks of colic from irregularities in diet. Sometimes the mischief resulting from the obstruction is more serious. In the case recorded by Scarpa,¹⁴⁶ which has already been referred to, the shells and claws of cray-fish were arrested at the injured part of the bowel, the coats of the intestine were ruptured, and feculent matter was effused into the cavity of the peritoneum.

Occasionally the inflammation, excited by the accumulation of hard and undigested substances at the contracted part, causes the cicatrix to open. This result may be regarded as

a favourable termination of the obstruction ; for the feculent discharge thereby obtained is generally followed by a relief of the inflammatory symptoms, and the wound in most instances soon closes.

TREATMENT OF INTESTINAL FISTULA.

After reflecting upon the various changes which conduce to the spontaneous cure of intestinal fistula, and the causes which sometimes interrupt the process, the surgeon will enter upon the treatment of abnormal openings in the intestines with the firm conviction, that in many instances he ought only to be a quiet spectator of Nature's work ; that he may sometimes gently aid her efforts by removing or mitigating such causes as disturb or interrupt her functions ; and that occasionally, when the natural efforts fail, he may feel justified in interposing the bolder hand of art.

As the treatment of hernia in a state of gangrene has already been discussed, it is only necessary in this place to consider the subsequent stage of the malady, when the sloughs have separated, the fæces are escaping from the wound, granulation is commencing, and the adhesions uniting the intestine to the neck of the sac are becoming firmly organized. In this stage, the process should be allowed to advance without interruption ; the comfort of the patient being secured by attention to cleanliness, the frequent removal of the excretions, and by correcting the fetor of the discharges by the application of linen wet with some antiseptic lotion (creasote half a drachm, distilled water one pint). Should inflammation exist within the abdomen, it must be combated by appropriate treatment. The strength of the patient should be supported by nutrient liquids ; and, if the passage of fæces from the lower part of the intestinal canal be not entirely interrupted, the occasional evacuation of the lower bowel must be promoted by means of clysters.

During the progress of the case, those changes which have

been already noticed as conducing to the permanent restoration of the alimentary canal, and to the closure of the external wound, gradually proceed, and more or less perfectly accomplish the cure. In aiding these processes, or in altogether superseding them when they are ineffectual, various remedial measures are indicated.

The two principal indications to be fulfilled in most cases are, to remove the obstruction caused by the projecting ridge or valve, and to close the external wound. Besides these, there are others, which are often important, and even essential to be fulfilled. These indications, and the means by which they may be accomplished, will be considered in the following order :

1. To diminish or remove the obstruction from the projecting ridge or valve.
2. To support nutrition.
3. To solicit the natural action of the bowels.
4. To prevent or relieve prolapse.
5. To prevent premature closure of the external wound, or to obviate the evils resulting from it.
6. To close the external wound.
7. To palliate the evils of fistula when it cannot be cured.

1. *To diminish or remove the obstruction from the projecting valve or ridge.*—The means by which this object may be entirely, or in part, accomplished, are, diet, external pressure, direct pressure on the projecting part, and surgical operation.

Diet.—It has been already shewn that the intestinal contents, in passing over the projecting ridge, have a tendency gradually to diminish its prominence, and to push it towards the lower opening of the intestine. Guided by this observation, Scarpa, in accordance with the views of Louis, and in opposition to those of La Peyronie, who adopted a rigid diet, under the hope of speedily closing the external wound, recommended that the patient should be nourished by an abundant quantity

of nutriment of good quality, and of easy digestion, in order that the alimentary canal might be distended at the injured part, and sufficiently dilated to allow of its functions being well performed before the abnormal opening closed.

In availing ourselves of the mechanical assistance of the intestinal contents for pushing back the projecting valve, and thereby restoring their natural course, I would advise the employment of a moderate quantity of non-stimulating nutritious food, avoiding all extremes, either in the way recommended by La Peyronie, or in that pursued by Scarpa. The rude plan of distension adopted by the latter would, especially in an early stage of the process, tend to destroy the adhesions upon which the safety of the patient depends. The employment of purgatives, which Scarpa regards with favour, I also consider to be highly injudicious; since, by unduly exciting the peristaltic action of the intestines, it is calculated to disturb the recently formed, and perhaps imperfectly organized adhesions, and to interrupt the process of nutrition. In some cases it is even necessary to give astringent medicine, to retard the unduly accelerated transit of alimentary matter, which is most liable to occur, and to produce injurious effects when the opening is situated in the upper part of the canal. When a portion of the intestinal contents makes its way into the lower part of the tube, the occasional use of simple clysters is in some cases necessary.

External pressure.—Pressure applied to the external opening, so as more or less perfectly to prevent the escape of the intestinal contents, may sometimes be beneficially employed in causing the alimentary matters to press with greater force upon the projecting ridge, and thereby to aid in diminishing the obstruction which it causes. But, in thus employing pressure as a remedial agent, great caution is required. In the early stage, before the adhesions are fully organized, it may give rise to feculent effusion in the peritoneum; and at

any period, unless its effects be carefully watched, serious intestinal obstruction might be produced.

Direct pressure upon the projecting ridge.—Desault attempted to remove the obstruction by introducing into the two ends of the bowel a long tent, so as to dilate the lower portion of intestine, and to facilitate the passage of fæces. In this way he tried to efface the angular projection, and to cause the two ends of intestine so far to correspond that the alimentary matters might find a passage from the superior to the inferior opening. He placed also a plug of linen in the external aperture to prevent the escape of fecal matters, and assisted the treatment by laxatives and clysters. When success attended the plan, it was first indicated by the escape from the anus of air, and then of fæces; and, as the latter increased, the external wound contracted. Desault adopted the practice in the case of François Vialter, a sailor, who was wounded in the abdomen by the bursting of a bomb. The wound was situated on the right side, and extended from two inches above the external ring to the bottom of the scrotum, where it had exposed the testicle. A portion of intestine, an inch in length, completely divided by the accident, appeared at the upper part, and was withdrawn into the abdomen during the washing of the wound. This injury was followed by intestinal fistula and double prolapse. After four years he entered the Hôtel Dieu at Paris, on the 29th of September 1790, when “the prolapse had acquired a considerable bulk, its form was nearly conical, and it measured nine inches in length; the middle and anterior part was very prominent. Its basis, rather contracted, appeared to proceed from beneath a fold of the skin just above the ring; the apex reached to the middle of the thigh, and possessed a small opening, through which the fæces issued. Nothing had passed by the anus since the period of the wound, except a little whitish matter, at intervals of three or four months. The surface of the swelling was everywhere red and folded;

and these folds, resembling the valvular productions of the mucous membrane, were particularly conspicuous below. A smaller swelling, similar to the former in colour and consistence, was placed externally to it, having an oval form, and discharging a little serous fluid from a puckered orifice. Both possessed a kind of peristaltic motion, which could be excited by throwing a few drops of water on them." By pressure with the hands, continued for a few minutes, Desault succeeded in diminishing the size of the swelling; and, after maintaining a moderate degree of pressure with a bandage for four days, he accomplished the entire reduction of the prolapse. A thick linen tent, three inches in length, was introduced into the intestine, and maintained there by a proper bandage. He "proposed to remove this twice a day for the evacuation of fæces; but after some noise in the bowels, accompanied by an acute sense of heat, wind passed by the anus; colicky sensations, and twitching pains in the rectum, followed; and half a pint of fluid matter was discharged through the rectum. Eight evacuations of the same kind, preceded by similar feelings, took place during the night, and made the patient rather weak. The stools were very numerous in the three following days; but they gradually became thicker, and diminished in number. The linen tent was discontinued on the eighth day, and the opening was closed by lint and compresses, supported by a truss with a broad flat pad. This plan entirely prevented the escape of fecal matter by the wound. The young man perfectly recovered.¹⁴⁷

In a case resembling the above, Scarpa adopted a somewhat similar practice. He introduced into the fistulous canal a tent of linen about the size of the finger, an inch and a half long. In a few hours the patient repeatedly went to stool. The use of the tent was continued for a week, and afterwards simple dressings were applied to the wound. The external opening, however, did not permanently close, and it was

necessary for the patient to continue the use of the tent, supported by a bandage.¹⁴⁸ The practice of Desault was successfully adopted in a case treated by Larrey.¹⁴⁹

Dupuytren¹⁵⁰ also attempted to relieve the obstruction by direct pressure against the projecting ridge from without. For this purpose he constructed an instrument, of which one end was a crescent, three-quarters of an inch in width, the edge and points being smooth and covered with linen. This crescent was fixed on a stem, two or three inches long, terminated by an elongated plate, perforated with openings at each end for the passage of strings, by means of which the instrument could be fixed in its place. This plan was tried in 1809 on a patient in the Hôtel Dieu. Pain, colic, and nausea soon came on, and he left the hospital unrelieved.

The practice adopted by Desault and Dupuytren is here introduced more for the purpose of completing the history of accidental anus, than as a plan to be imitated. I do not consider that in any case the surgeon is justified in thus incurring the risk of disturbing the adhesions which unite the intestine to the walls of the abdomen and the sac.

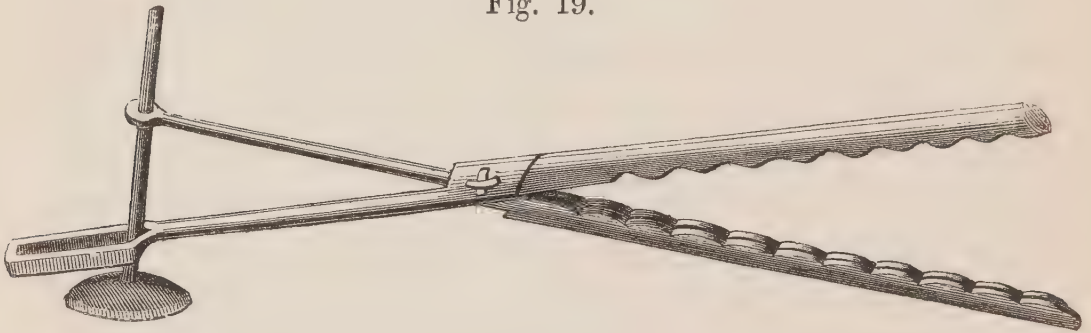
Perforation of the partition.—M. Dupuytren,¹⁵¹ not satisfied with the various attempts which had been made to push back the projecting angle, conceived the idea of establishing a direct communication between the two portions of intestine, by perforating or destroying the intervening angle and partition. Having ascertained, by experiments on animals, that a seton, passed from one portion of bowel to the other through their contiguous walls, excited adhesion of their peritoneal surfaces, he practised this process on the 17th of May, 1813, upon a man, thirty-six years of age, who had intestinal fistula following the loss of a loop of intestine three or four inches in length, in consequence of gangrenous hernia. The two ends of intestine were lying parallel to each other, and were separated by a very prominent ridge. M. Dupuytren cautiously passed a curved needle as high as possible into the

upper portion of intestine, and brought it out at the corresponding part of the lower portion, armed with a thread, which was allowed to remain in the perforation. A few days after, a seton attached to the thread was drawn through the same opening; air of feculent odour soon began to pass by the anus. After eight days, the size of the seton having been gradually increased, the patient experienced some pains in the abdomen, and fæces began to take the natural course. The projecting ridge, reduced to a narrow band as the aperture was progressively enlarged, at length gave way, and a free communication between the two ends of intestine was established. Some portions of intestinal matters still escaped by the wound; and M. Dupuytren, desirous of preventing the unnatural discharge, and concluding that the two portions of intestine had become adherent to a considerable extent beyond the perforation, cut away portions of the partition by curved probe-pointed scissors, repeating the operation at intervals of three or four days. Yielding at length to the importunities of his patient, he one day removed the intervening substance more freely; and peritonitis, speedily proving fatal, followed. On examination of the body, no opening into the peritoneum could be detected, and there was not any feculent effusion. The opening between the two portions of intestine was about two inches in extent. The two extremities, formerly separated by a prominent angle, now presented a uniform cavity, on the posterior wall of which was observable the cicatrix which marked the place of section of the intestine. A similar operation had been previously performed by Schmalkalden in Germany, and by Dr. Physick in America, without being known to M. Dupuytren.

Destruction of the partition by the enterotome.—From the difficulty of passing the needle to a sufficient height in the intestine, and from the danger of there being perforation without adhesion in those cases where the two portions of intestine were not parallel and in contact, M. Dupuytren

relinquished this mode of operation, and directed his energies to the discovery of one less objectionable. Accordingly he devised an instrument, which he has named the *enterotome*,¹⁵² (fig. 19,) calculated to seize the parts, to hold them in apposition, and forcibly to compress them. The result of its application would be, the destruction of the vitality of the inclosed part, the detachment of the dead portion by the

Fig. 19.



Dupuyten's Enterotome. After Bourguery.

sloughing process, and the union by adhesion of the adjacent living parts, held in apposition by the instrument.

The instrument is a kind of forceps, consisting of three pieces; namely, two branches, which lock like the blades of forceps used in midwifery, and a screw, whereby the handles can be approximated or separated. The branches are each six or seven inches in length, consisting of the blade and the handle, between which is the part constituting the joint. The blade of the male branch is received, to the depth of a line, in a groove formed in the female branch, as the edge of a pocket-knife fits into the groove of its handle. This blade is four inches long, three lines wide, and half a line thick on what may be called its cutting edge, which is undulated, and terminates in a small spheroidal button. The female branch is grooved to receive the cutting edge of the male, the margins of the groove being undulated in correspondence with the waving line of the male branch. The button at the end of the male is received into a cavity of the female branch.

The blades separately introduced into the two portions of intestine, and afterwards approximated, compress the projecting ridge and intervening partition between their undulating edges. By increasing the pressure, the inclosed parts lose their vitality, and are afterwards detached, being retained within the grasp of the instrument. Whilst the partition is thus undergoing division, the accompanying adhesive process prevents the cavity of the peritoneum being laid open.

Before applying the instrument, it is necessary to ascertain with precision the situation and direction of the two ends of intestine. The superior opening, from its large size and the escape of feculent matter, may in general be easily detected ; but the lower aperture, which is usually reduced in size, pushed out of its original position, and concealed by the projecting valve and the inequalities in the wound, is with difficulty found, and has sometimes, even by M. Dupuytren, not been detected until after several days have been devoted to the search.

This object being attained, the operator introduces one branch of the enterotome, guided by the fore-finger of the left hand, into one end of the bowel, to a depth varying according to circumstances from one to four inches. An assistant now supports this branch, whilst the surgeon introduces in the same manner the second branch into the other portion of bowel to the same depth. The two branches are now united, like those of forceps used in midwifery, care being taken that the button at the end of the male is received into the cavity of the female branch. The approximation of the blades is now effected by means of the screw, to such a degree as to destroy the vitality of the included part. Every second day the pressure must be increased, lest from the shrinking of the included tissues, the circulation in these structures should not have been perfectly arrested.

During the time the enterotome is applied, it is necessary to employ a diluent diet, perfect rest, emollient fomentations,

and mucilaginous clysters frequently repeated. Slight pain, or moderate increase in the heat of the skin, or frequency of the pulse, need not excite alarm; but if inflammatory symptoms of considerable intensity occur, attended with nausea, hiccup, and vomiting, local and general evacuations of blood, repeated according to circumstances, the most rigid diet and the occasional use of sedatives are required.

According to Dupuytren, the employment of the enterotome does not usually give rise to pain, colic, vomiting, intestinal obstruction, or constitutional irritation. On the contrary, he states that such symptoms only occurred in a small proportion of the cases in which he operated, and that the inflammation was limited to the parts embraced by the instrument.

When first applied, the enterotome is fixed; after a few days it becomes loose, its mobility increasing until it drops out about the eighth day, carrying with it the included portion of the intestinal coats, in a dry state, resembling parchment. By this loss of substance, the obstruction produced by the projecting valve and intervening partition is removed, and a direct communication between the upper and lower portions of intestine is established. The fecal matters frequently begin to resume their natural course even before the instrument is detached. For a few days the evacuations are generally liquid, frequent, and attended with griping; by degrees they become more solid and less frequent, and at length assume a natural character. After the separation of the enterotome, the external wound, for some time, rapidly diminishes in size; but it is generally slow in completely cicatrizing, sometimes requiring the assiduous efforts of the surgeon to be exerted during many weeks or months before its closure is completed.

An opportunity was afforded to Professor Lallemand of examining the body of a patient seven years after he had been successfully treated by the enterotome for abnormal anus following gangrenous hernia. "On examining the body after

death, there was found in the left inguinal region an oblique fistulous opening, of the size of a crown, leading into the canal. Around this, to the extent of five or six lines, was a thin shining cicatrix, in which wrinkled folds of the skin terminated. A portion of ileum, not differing from the usual appearance of the intestine, was adherent to the left inguinal region by two slender columns. One of these, four lines long by two in width, contained the canal of communication between the fistula and the cavity of the intestine. This canal passed through the inguinal ring, which was short and nearly direct. The other was an ordinary slender fibrous adhesion." "As soon as the fistulous communication had passed the ring, it began to enlarge and assume the funnel shape, and was quickly lost in the cavity of the intestine. When the latter, which presented the usual circular figure, was laid open, a slight prominence marked the situation which had been occupied by the ridge; the mucous membrane was just the same here as elsewhere. In short, the intestine, which had not only been retracted within the abdomen, but carried to some distance, so as to be quite free from the inguinal canal, except at the adhesion already mentioned, had recovered its natural curve within the belly, and presented very little appearance, either on the exterior or interior, of the loss of substance which it had undergone, and of the operation by which the natural course of its contents had been restored." ¹⁵³

M. Dupuytren gives the following statement of the result of forty-one operations by means of the enterotome, performed by himself, M. Lallemand, and others. The abnormal opening in three-fourths of these cases resulted from gangrenous hernia; in the remaining fourth, from wounds of the abdomen, with more or less loss of substance of the intestine. Three of the patients died; one from feculent effusion, a second from "indigestion," and a third from acute peritonitis. Of the remaining thirty-eight, the greater part expe-

rienced no unfavourable symptoms ; colic, nausea, and vomiting, however, occurred in some, but yielded to aerated draughts, leeches applied near the anus, fomentations, and abstinence. Recovery was not equally perfect in all: nine had fistula remaining, which required the use of a compressing bandage to prevent the escape of air, mucus, bile, and even feculent matters. The remaining twenty-nine were permanently and completely cured in a period varying from two to six months.

From the observations of M. Jobert, it appears that the operation with the enterotome has not proved so mild in its effects when practised by other surgeons as in the cases treated by M. Dupuytren. He found that the patients were affected with fever and vomiting, and that the face became contracted and of a dark hue. He states that a patient died from inflammation, occasioned by the use of the enterotome, in the Hôtel Dieu of Amiens, and that other fatal cases have been recorded. A patient treated by M. Velpeau¹⁵⁴ died from fecal effusion on the seventh day after the application of the enterotome. Scarcely any adhesion had been effected.

These unfavourable results ought not only to guard the operator from being too sanguine in his expectations of success, but also to impress upon his mind the importance and necessity of using every effort to avert or mitigate those injurious consequences to which the operation, undoubtedly fraught with danger, may probably give rise.

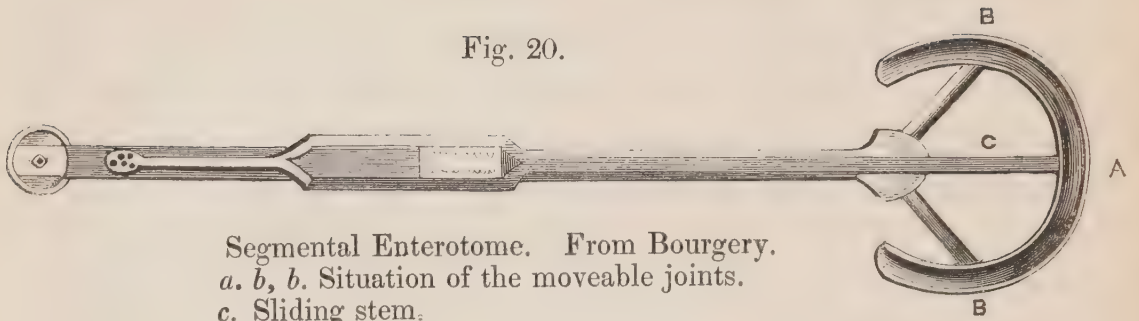
Modification of the enterotome.—M. Delpech successfully employed, in a case of intestinal fistula following mortified hernia, an instrument somewhat differently constructed from that of M. Dupuytren. Each of the branches was a little curved, and ended in an oval plate an inch in length. When introduced, and brought together by the screw, in consequence of the curved form of the branches, such portion only of the intestinal partition was compressed as was inclosed between the two plates. The object was to de-

stroy a smaller portion of the partition at one time, and to repeat the process until a sufficient opening should be made in it. It was also imagined that the form of opening thus produced would be more advantageous than the elongated slit resulting from the application of Dupuytren's instrument. The result of this case was perfectly satisfactory, but it is doubtful whether the modified form of the enterotome possesses any advantages over the original. The broad extremity of the blades would generally be attended with more difficulty in the introduction, when the external wound is much contracted; and, on bringing the compressing parts of the blades into apposition, there would be greater risk of including within their grasp neighbouring portions of omentum or intestine. Besides, it is known that the elongated opening produced by Dupuytren's enterotome is quite adequate to the free transmission of the intestinal contents, and that by their pressure it assumes a rounded form. In the case examined by Professor Lallemand seven years after the operation, the intestine "presented the usual circular figure."

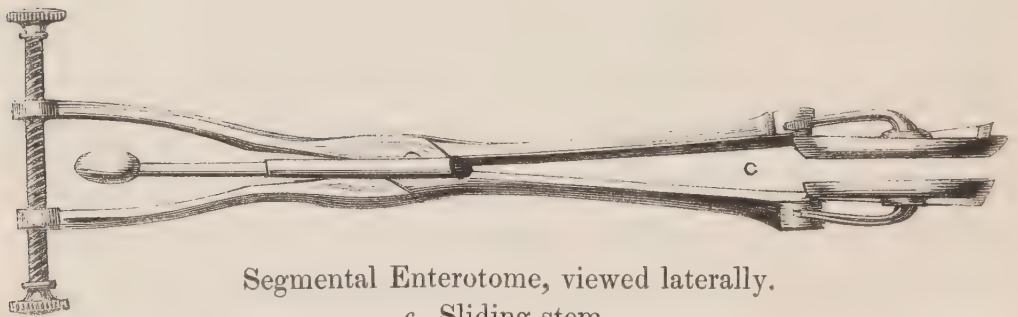
With a view of obtaining a circular opening in the partition, an enterotome has been devised, having each of the branches terminated by a large segment of a circle. One segment has a prominent edge, which is received into a corresponding groove in the other. Each segment is provided with joints, moved by a sliding stem, allowing their circular form to be temporarily altered into the elliptical, for the convenience of introduction into a narrow aperture.

In an obliging communication which I have received from M. Bourgery, he informs me, that the instrument represented in the accompanying figures is his own modification of the enterotome of M. Liotard. The instrument of the latter surgeon was successfully used on animals, and once employed with advantage on the human subject, by M. Blandin, who experienced much difficulty in the

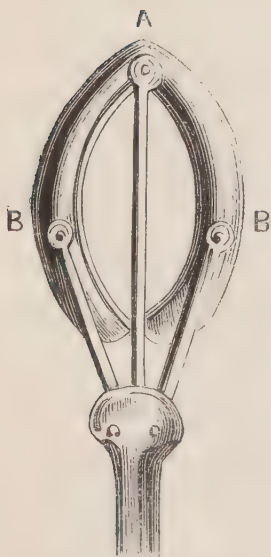
Fig. 20.



Segmental Enterotome. From Bourgery.
a. b. Situation of the moveable joints.
c. Sliding stem.

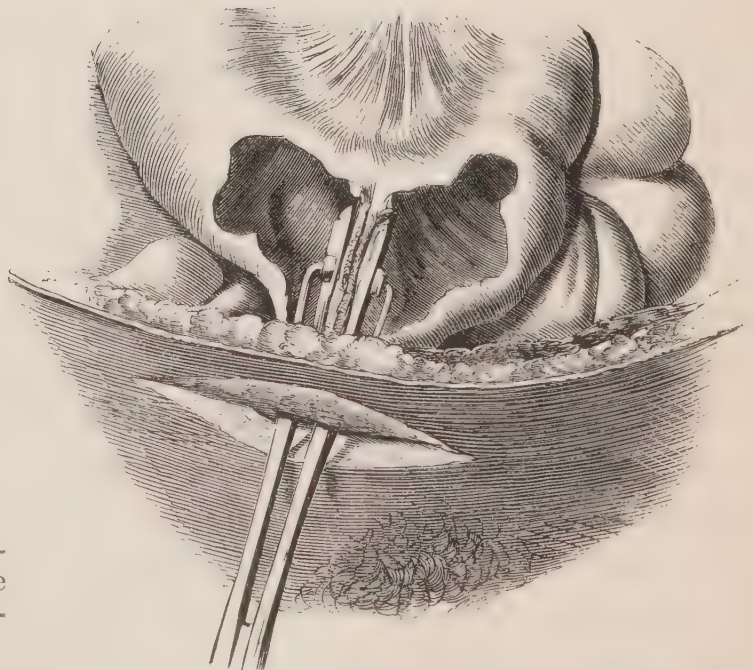


Segmental Enterotome, viewed laterally.
c. Sliding stem.



Head of Segmental Enterotome, closed for the purpose of introduction.

a. b. b. The moveable joints.



Segmental Enterotome applied.

introduction of the large circle into the fistula; on which account M. Bourgery devised the present modification, whereby the breadth of the compressing part of the instrument can be diminished.

Time of operation.—From the successful case of Delpech, in which the enterotome was applied on the forty-first day after the gangrenous hernia was opened, it appears that the operation may be safely undertaken at this early period: but it may be doubted whether, as a general rule, the time selected in this case is not earlier than is desirable, at least in those cases of intestinal fistula which result from mortified hernia; for it has been shown, that, in this form of the affection, the spontaneous efforts of nature to relieve the local mischief are great, and that they are progressively advancing for a long period of time. It would therefore be unwise to subject the patient to so formidable an operation until all hope of spontaneous cure had ceased. When the abnormal opening has been produced by wound of the abdomen attended with loss of substance of the intestine, there is less hope of the natural powers restoring the continuity of the canal; and consequently, in such cases, the enterotome might with propriety be applied at an earlier period.

Future experience must decide whether it is safer to apply the pressure in the first instance with such intensity as entirely to destroy the vitality of the included parts; or to use more moderate pressure at first, and gradually to increase it afterwards. M. Dupuytren says, "We need not fear to carry the pressure of the enterotome on the first day so far as to suspend life in the included parts. This is the plan most likely to prevent pain and inflammation." Mr. Lawrence recommends that the pressure of the forceps should be lessened by means of the screw, and again increased when the patient can bear it, if pain and other symptoms occur which cannot be removed by

the use of warm cloths and fomentations. This gentleman is also of opinion that a firmly consolidated union of the divided parts is more likely to be attained by proceeding slowly; and he seems to attribute the want of success in the case treated by Velpeau to the rapidity with which the parts were divided. But in this case the division was not effected until the seventh day after the application of the instrument, which is but one day earlier than the average period when the section has been accomplished with perfect adhesion. The failure therefore of the adhesive process, and the consequent effusion of *fæces* into the peritoneum, cannot justly be imputed to the rapidity with which the section was accomplished; but may rather be attributed to some constitutional peculiarity, which, after this as well as other operations, occasionally renders abortive the adhesive process, and favours the development of diffuse inflammation. Analogy would lead us to expect that compression, carried at once to such an extent as entirely to extinguish vitality, would be less likely to produce serious irritation, than a more moderate degree of pressure. This is, however, a question which experience alone can decide; and to this test must also be referred the question whether the destruction of the septum throughout its whole length at one attempt, as practised by Dupuytren, or by successive portions, as adopted by Delpech, be the milder and safer mode of proceeding.

The failure of the case of Velpeau from a defective state of the adhesive process, shows the great importance of ascertaining, before this formidable operation is attempted, whether the state of health of the patient is favourable for a reparative or plastic process. This question would be determined, so far as we are able to do it, by making ourselves assured of the absence of such conditions of the system as are known to be unfavourable to reparative processes, more especially those of the serous membranes.

Thus, a state of rheumatic, syphilitic, tubercular, or carcinomatous cachexy, or an obviously defective performance of the renal, hepatic, or cutaneous functions, ought absolutely to forbid the performance of the operation. In this, as in all serious surgical operations, I would strongly inculcate the importance of investigating the condition of the urine, as regards the presence of albumen in this excretion; since the state of the kidneys which usually gives rise to this albuminous admixture is attended with such an impaired state of the general health as frequently to render unsuccessful the best executed operations.

Second indication. To support nutrition. — Attention to this indication is more especially required when the abnormal opening is situated at the upper part of the intestinal canal, allowing the alimentary matters to escape before they have been exposed to a sufficient extent of absorbing surface. This cause of defective nutrition is sometimes aggravated by an accelerated transit of the intestinal contents. By attention to diet, and the exhibition of nutrient clysters, these evils may sometimes be successfully combated.

The diet should consist of liquid animal matters, as milk, broths, and eggs, combined with farinaceous vegetable substances, given in moderate quantities, and repeated at very short intervals. The clysters may be composed of the same materials, and repeated every fourth or sixth hour. When the transit of the alimentary matters is too rapid, the peristaltic action may be tranquillized by small and repeated doses of opium.

Third indication. To solicit the natural action of the bowels. — This object may be promoted by the judicious use of purgatives and clysters. In numerous instances, the first return of the natural evacuations occurred soon after the employment of these remedies. In a patient, treated by Scarpa, the excrements resumed their natural course, after having

been entirely discharged by the wound for four months, on the same day that he took a purgative of senna and manna, and the wound was cicatrized in a fortnight afterwards. Scarpa,* whose authority is entitled to the highest respect, was of opinion that an abundant allowance of food easy of digestion, continued for some weeks, in conjunction with the uninterrupted use of slightly stimulating clysters, and the occasional exhibition of a purgative, induced the feculent matters gradually to take their course by the rectum. I must here repeat the cautions already expressed respecting the use of purgatives. They should only be employed when the affection has assumed a chronic form, and even then all those of an acrid and irritating nature should be avoided.

Fourth indication. To prevent or relieve prolapse.—Protrusion of the bowel through the abnormal opening is not only a source of suffering, and even of danger, but also a serious obstacle to the cure of intestinal fistula. The prevention or relief of this affection is, therefore, a most desirable object.

Pressure suitably applied, and the linen tent, have been beneficially employed as preventive means. The degree of pressure must be moderate, and such only as to give support to the breach in the abdominal walls, and not so powerful as to compress the membranous funnel, and diminish its capacity. A pad slightly concave, so as to correspond to the moderate convexity of the abdomen, may be placed over the opening, and fixed by a bandage or an elastic spring. This apparatus is well adapted to the purpose, and ought to be employed whenever a tendency to eversion of the bowel is observed. In addition to slight external pressure, a tent of linen was successfully used by Desault. When the tent is employed, a greater degree of external pressure may be borne.

Scarpa† adopted with success a similar plan of treatment in this reducible condition of the protrusion. After returning

* Op. cit. p. 335.

† Op. cit. p. 340.

the inverted intestine, he introduced into the fistulous canal a tent of linen about the size of the finger. Not only was the protrusion relieved, but soon after the introduction of the tent the fæces began to pass by the natural route, notwithstanding the presence of the tent in the fistula.

When the prolapse is irreducible by the hand, continued pressure of moderate force, aided by recumbency, has succeeded in reducing the swollen state of the tumour, and ultimately has rendered it capable of being returned.

Should the pressure of the cicatrix threaten the destruction of the protruded part from strangulation, an attempt should be made to relieve the part by dividing the stricture. And, if the abnormal aperture is the site of hernial protrusion, moderate pressure with the flat or slightly concave pad, recommended for prolapse, will generally afford relief.

Fifth indication. To prevent premature closure of the external wound, or to obviate the evils resulting from it.—The symptoms indicating premature contraction of the wound are such as may be attributed to partial or complete obstruction of the bowels; namely, scanty or suppressed evacuations, tension and pain in the abdomen, eructations, and vomiting. These symptoms may be slight at first, and only occasional; they may become more intense and frequent, and, if not relieved, may be followed by hiccup, intermittent pulse, prostration, and death. Under these circumstances, perforation of the bowel, and feculent effusion of the peritoneum, will generally be observed on dissection. On the first occurrence of symptoms indicating obstruction, provided they can be fairly attributed to the undue contraction of the external wound, attempts should be made to dilate it, so as to allow of the introduction of a flexible catheter into the bowel, whereby a portion of its liquid contents may be extracted. Clysters and purgatives may also sometimes be of use; but, from the difficulty of calculating precisely upon the effect of the latter, and the possibility that the impulse

given by them to the fæces may tend to produce laceration of the intestine, and effusion into the peritoneum, they should only be administered with the greatest caution, and ought not to be employed to the exclusion of such remedies as promote an early and free exit of the intestinal contents by the wound.

Relief having been obtained by the evacuation of liquid matter from the bowel by means of the elastic tube, time is allowed for the more gradual and complete dilatation of the opening. Bougies, sponge tents, and the instrument constructed by Mr. Weiss for dilating the female urethra, may all be found efficient aids to the surgeon. When, however, the symptoms are intense, and the abnormal opening is contracted to a small tube, it becomes necessary to lay open the fistulous tube as far as the membranous cavity. This mode of proceeding is sanctioned by the successful practice of Renaud. His patient, after the evacuations had become scanty and difficult, suffered from a fixed pain in the groin, attended with evident swelling above the cicatrix, vomiting, small pulse, and cold sweats. No relief having been obtained from bleedings, emollient poultices, and clysters, an incision was made into the cicatrix and abdominal muscles, and the membranous cavity embracing the two apertures of the intestine was thereby laid open. Fluid fæces were freely discharged; and a ball, as large as a nut, consisting of indurated feculent matter with a plumstone for its nucleus, was extracted. Two days afterwards the patient took a purgative, which produced its effect only by the wound. On the sixth day the excretions by the natural passage appeared, and on the twenty-first day the wound was cicatrized.

Infiltration of feculent matter beneath the integuments requires early and free incision.

Sixth indication. To close the external opening.—This is the last curative indication, and often the most difficult which the surgeon has to fulfil; but, before he attempts it,

he ought to be assured that the continuity of the intestinal canal is sufficiently restored to allow of the safe closure of the opening. In general, when the proper time arrives for the closure of the wound, nature anticipates the surgeon's work ; but when this part of the restorative process fails, and there exists a free passage for the alimentary matters by the natural route, the surgeon is justified in interfering.

Various means for accomplishing the closure of the wound have been employed with more or less success ; as, pressure, caustic, suture, autoplasty, and the cutaneous plug.

In employing pressure, the principal object is to prevent entirely the discharges from traversing the external wound. When this is accomplished, the wound generally exhibits a greater tendency to contract and cicatrize. Care must be taken that the pressure be not so concentrated or forcible as to compress the membranous cavity, and thereby obstruct the course of the fæces, and counteract the desired object. The pressure, to be successful, should, in the first instance, be effected through the medium of a broad and flat surface. Afterwards, a greater concentration of it may be adopted by means of graduated compresses ; but the effects of such attempts must be carefully watched, and, if the slightest indication of obstruction occur, the flat compress must be resumed, or the pressure for a time entirely discontinued. During the treatment, confinement to bed should be insisted upon.

The usual mode of applying pressure is by means of an elastic truss. Mr. Hey¹⁵⁵ employed a linen compress and bandage ; over which was placed a two-ounce weight, and afterwards a weight of four ounces.

When the fistulous canal has assumed the character of a cicatrized surface, it has been sometimes advantageous to produce a granulating sore, by *caustic*, *cautery*, or *the knife*, preparatory to the steady adoption of the treatment by pressure. But all these means, however well devised and

practised, will, in many instances, fail to produce the desired effect.

Attempts have repeatedly been made in obstinate cases, by Cruikshank, Sir A. Cooper, Dupuytren, and others, to close fecal fistulæ by *suture*, but unfortunately without success.

Velpeau made several attempts in the same subject to accomplish this object by *autoplasty*, but was unsuccessful in them all. He afterwards employed the *cutaneous plug*, which had succeeded in two cases of laryngeal fistula. He took a portion of skin from the side, doubled it on its external or cuticular surface, and pushed it into the opening, fixing it there by means of four sutures. There was a fecal oozing the next day, and the borrowed portion of skin mortified.¹⁵⁶

Seventh indication. To palliate the evils of fistula when it cannot be cured. — When all curative efforts fail, or the patient is unwilling to submit to the prescribed treatment, the efforts of the surgeon may be advantageously directed towards alleviating the sufferings of the patient, and rendering him less offensive to himself and others. For this purpose various mechanical contrivances have been adopted.

Pressure by the truss has been employed so as to constitute, as it were, an artificial sphincter, allowing, by its occasional removal, the periodical evacuation of the bowels. When the abnormal opening is situated in the colon, where the fecal matters have acquired some degree of solidity, this mode may frequently be adopted with success; but when the opening is in the small intestines, and of large size, it is difficult to prevent the escape of liquid fecal matters.

Dr. Cheston's ¹⁵⁷ patient, in whom there was a large opening communicating with the ileum, was able to prevent all escape of fæces from the wound by using a compress and bandage, for which he afterwards substituted a truss. This case was remarkable from the circumstance, that, when the escape of fæces from the wound was thus mechanically prevented, they took their natural course.

Receptacles of leather, horn, or tin, with their opening applied over the fistulous aperture, and connected to a strap going round the body, have been sometimes employed.

Juville ¹⁵⁸ delineates an apparatus, which consists of an ordinary inguinal truss, with an ivory pad perforated in the middle so as to fit the opening. A tube of elastic gum, furnished with a valve opening downwards, leads from this perforation to a receiver of silver, which is attached by a screw to the lower end of the tube, and lies against the inside of the thigh. The silver vessel may be unscrewed and emptied without disturbing the rest of the instrument.

In a case of intestinal fistula with double prolapse, Sabatier ¹⁵⁹ employed a truss with a pad of box-wood, so constructed as to prevent by pressure the protrusion from the lower opening, and perforated to receive the prolapse from the upper aperture. A silver tube, continued from the aperture in the pad, conducted the excrement to a box of tin.

PART II.

ABDOMINAL HERNIA CONSIDERED IN REFERENCE TO ITS SPECIES AND VARIETIES.

CHAPTER I.

INGUINAL HERNIA.

(BUBONOCELE,* *oscheocele*.)†—Those herniæ which traverse one or both of the abdominal rings, or protrude directly into the inguinal canal, are named inguinal, and present three well-marked varieties; namely, *oblique inguinal hernia*, *hernia of the tunica vaginalis*, and *direct inguinal hernia*. These varieties are still further diversified by the varying character of the protruded parts, and by numerous accidental implications.

1. *Anatomy of the region of Inguinal Hernia.*

α. *The subcutaneous filamentous tissue.*—The skin of the lower and anterior part of the abdomen, as in every other part of the body, is connected with the subjacent muscular and tendinous structures by a layer of filamentous tissue of varying thickness, which lodges the superficial blood-vessels, lymphatics, and nerves, and which is, in this part more particularly, separable by slight dissection into two layers: one, external, of loose texture, adherent to the skin, and con-

* Βουβων, the groin, and κηλη, a tumour.

† Οσχρον, the scrotum, and κηλη.

taining a considerable quantity of adipose tissue ; the other, internal, membranous, and, for the most part, devoid of fatty tissue. The latter layer is attached somewhat loosely by delicate filaments to the surface of the external oblique muscle and its aponeurosis, except at the linea alba, the external ring, and Poupart's ligament, where a stronger adhesion exists from the intermixture or preponderance of the white fibrous tissue in its composition. In emaciated subjects the two layers are so closely incorporated as to have the appearance of one expansive layer.

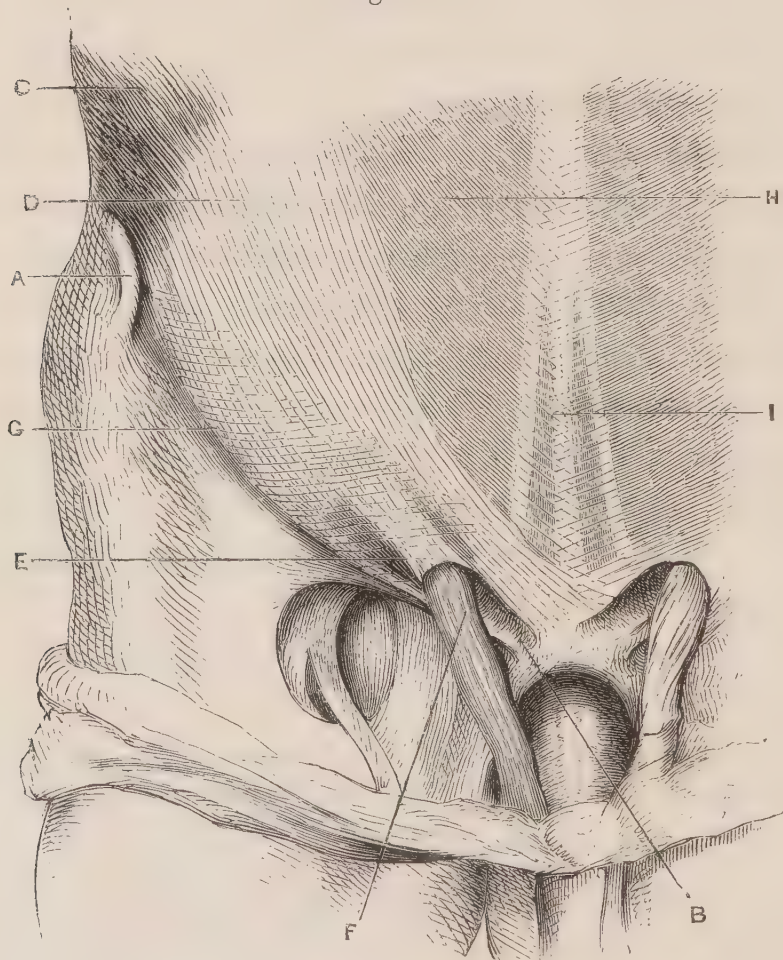
By some anatomists the entire subcutaneous tissue of this region is named *superficial fascia* ; by others the appellation is limited to the internal layer.

After being attached to the borders of the external abdominal ring, the deeper layer is prolonged downwards as an investment of the spermatic cord and testicle, and is named the *spermatic fascia* (fascia of the cord). The superficial layer, on approaching the scrotum, undergoes a sudden and remarkable change of structure. It no longer contains adipose matter, but consists of loose filamentous tissue, which is attached internally to the spermatic fascia, and externally becomes closely connected, and, indeed, intimately intermixed with what can hardly be called a distinct membrane, although many anatomists have described it as such under the appellation *dartos*. From a close examination of the tissues of the scrotum, I am induced to conclude that the filamentous tissue in this situation becomes more largely intermixed with the unstriped muscular tissue, which I believe may also be found, although in much less quantity, mixed with the filamentous tissue lying immediately subjacent to the skin of the entire body. As Dr. Todd and Mr. Bowman observe, "these unstriped fibres may be detected by the addition of acetic acid, which, by bringing into view the peculiar corpuscles they contain, distinguishes them from both the white and yellow fibrous elements of the

areolar tissue.”¹⁶⁰ From frequent examination I am convinced of their presence in considerable quantity, and I am induced to apply to this layer of filamentous tissue, intermixed, as it is, with the unstriped muscular tissue, the old name of *dartos*.

b. Aponeurosis of the external oblique muscle.—The external oblique muscle, descending from the eight lower ribs, terminates in an expansion of tendon which is extensively spread over the front and lower part of the abdomen. (Fig. 21.) This aponeurotic structure is narrow above, and broad

Fig. 21. *



Lower portion of aponeurosis of external oblique.

A. Anterior superior spinous process of ilium. B. Spine of pubes. C. External oblique muscle. D. Aponeurosis of external oblique. E. External abdominal ring. F. Spermatic cord. G. Poupart's ligament. H. Rectus muscle seen through its sheath. I. Pyramidal muscles.

below ; it extends downwards from the ensiform cartilage to the spine of the ilium and the pubes, joins its fellow in the median line, adheres closely to the tendon of the internal oblique muscle at the linea alba, and less firmly at the linea semilunaris. It is thin above the umbilicus, thicker and stronger as it approaches the lower part of the iliac and pubic regions. The lower portion of this aponeurosis is arranged in strong fasciculi, which run, for the most part, in a parallel direction from the anterior superior spinous process of the ilium to the pubes ; but, before reaching the latter, unite together and form two slightly diverging columns. These columns, or *pillars*, as they are usually termed, by their divergence leave an irregular space between them, known as the *external abdominal ring*, which is traversed in the male subject by the spermatic cord, and in the female by the round ligament. The *superior pillar* of the ring is flat and thin, and is inserted into the anterior and upper portion of the pubes, the symphysis, and the pubes of the opposite side ; some of its fibres interlacing with those derived from the tendon of the opposite side. The *inferior pillar* forms a thick and strong tendon, which is inserted into the spine of the pubes. From the posterior aspect of the inferior pillar is detached a crescentic process, named Gimbernat's ligament, which is attached to the pubic extremity of the ileo-pectineal line, and has its concavity directed outwards, or towards the femoral vessels. The cord, on quitting the ring, lies more or less upon the inferior pillar.

c. The *external ring*, E, in its normal state, approaches to a triangular form, the base of the triangle being formed by the pubes ; the apex, rounded and ill-defined, corresponding with the point of divergence of the two pillars. When this aperture has been distended by hernia, it assumes a more or less annular form. Its usual length from the base to the apex, in the male subject, varies from one inch to one and a half ; the breadth of the base is about half an inch. In the female

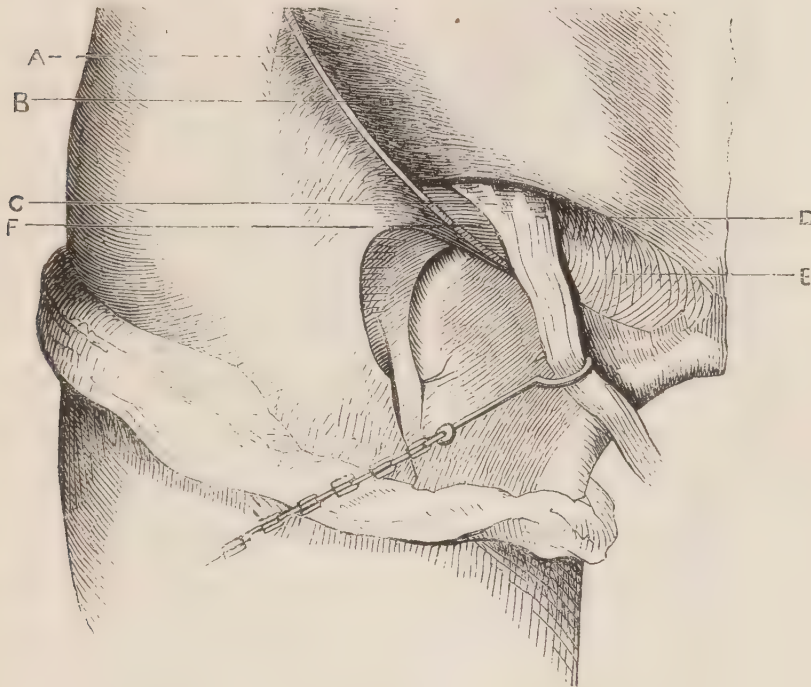
it is about half this size. The apex is rendered obtuse, and is strengthened by a series of fibres, named *intercolumnar*, arranged in fasciculi which arise from Poupart's ligament, and ascend towards the linea alba with a gentle curve, the convexity of which is directed towards the pubes. These fasciculi are strongest a little above the ring, and become gradually smaller, more widely separated, and straighter, as they approach the spine of the ilium. They are not interwoven with the other fibres of the external oblique, but are simply superimposed; adhering, however, to them with considerable firmness, and contributing to strengthen the general texture of the aponeurosis. They vary much in different subjects, being sometimes scarcely perceptible. In women they are generally weaker than in men. When they are totally wanting, which has not unfrequently been observed on dissection, the divergence of the columns, or *pillars* of the ring, is found nearly to approach the ilium, and the space or ring consequently much enlarged. This must necessarily be the case, and might *à priori* have been expected when the use of these cross fasciculi of an inextensible structure is considered; this being undoubtedly to prevent by their unyielding property the separation of the parallel fasciculi proceeding from the ilium and inferior muscular fibres to the pubes.

The lower border of the aponeurosis forms, with the assistance of similar aponeurotic structures of the thigh, a strong tendinous band, stretching from the spine of the ilium to the pubes, known as *Poupart's ligament*, or the *femoral arch*, which will require more particular notice when the region of femoral hernia is described.

d. The lower portion of the internal oblique muscle.—After the lower portion of the aponeurosis of the external oblique has been removed, the loose fleshy fasciculi of the internal oblique muscle are seen arising from the iliac half of Poupart's ligament, passing nearly in a transverse direction in front of the

upper portion of the spermatic sheath, and soon terminating in fine tendinous fibres, which pursue their course in a slightly curving direction, to be inserted in the pubes near its symphysis. These tendinous fibres adhere firmly to the

Fig. 22 *



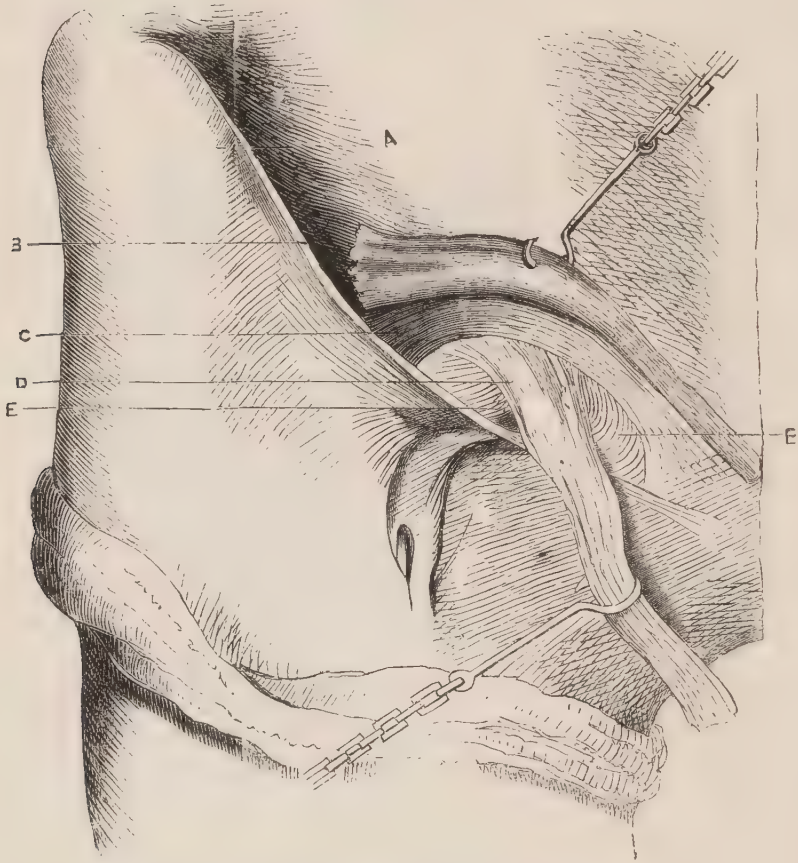
The lower portion of internal oblique muscle.

transversalis muscle, and to the sheath of the rectus. Their course may, in most subjects, be rendered apparent by putting the fleshy fasciculi on the stretch. The lower tendinous fibres of the internal oblique are thus ascertained to be perfectly distinct from those of the transversalis muscle, and to contribute but a very small space, if any, to the formation of the posterior wall of the inguinal canal.

* A. Poupart's ligament. B. Internal oblique muscle. c. Spermatic sheath and its contents, the cremaster muscle having been removed. D. Lower tendinous fibres of the internal oblique terminating in the sheath of the rectus and symphysis of the pubes. E, E. Lower fibres, for the most part tendinous, of the transversalis muscle, forming the posterior walls of the inguinal canal.

e. The lower portion of the transversalis muscle.—The lower part of the internal oblique having been removed,

Fig. 23.*



The lower portion of the transversalis muscle.

the inferior fasciculi of the transversalis muscle are seen arising from the external third of Poupart's ligament, closely connected with those of the former muscle, but pursuing a somewhat different direction, and having for the most part a different destination. On quitting Poupart's ligament, they at first slightly ascend, and pursue a curving

* A. Internal oblique muscle. B. Poupart's ligament. C. Lower fasciculi of transversalis muscle. D. Spermatic sheath and its contents, the cremaster muscle being removed. E, E. Lower tendinous, and occasionally fleshy, fibres of the transversalis muscle, descending behind the spermatic sheath to be attached to Poupart's ligament, and forming, conjointly with the internal aponeurosis or transversalis fascia, the posterior wall of the inguinal canal: other fibres proceed to the pubes and sheath of the rectus.

course in front of the very commencement of the spermatic sheath, and, whilst crossing the sheath, terminate in more delicate fibres, partly muscular, but for the most part tendinous, and in some subjects altogether tendinous; which, after having crossed the sheath, diverge as they proceed to terminate in their extensive line of attachment. The superior of these divergent fibres proceed nearly parallel to those of the internal oblique, and, conjointly with them, terminate in the sheath of the rectus and the symphysis of the pubes; others descend more directly to the body of the pubes; whilst the greater portion are attached to Poupart's ligament, along its pubic half, nearly as far as the point whence the lower fleshy fasciculi proceeded. The fibres which thus descend behind the spermatic sheath to be attached to Poupart's ligament are intimately incorporated with those of the internal aponeurosis, and conjointly with them form the posterior wall of the inguinal canal. The fibres of the transversalis muscle, which thus enter into the composition of the posterior wall, are chiefly tendinous; but in many subjects they exhibit some intermixture of muscular fibre, and in athletic persons sometimes possess a strongly marked muscular character. By this arrangement the inguinal canal, as Sir Astley Cooper has observed, is converted into a "muscular canal." Those fibres of the transversalis muscle, which encircle more or less completely the commencement of this infundibuliform process of the internal aponeurosis, or in other words the spermatic sheath, form an aperture of an oval form, but not generally well defined, which is the *internal abdominal ring*, and constitutes the internal opening of the inguinal canal; whilst the external opening of this canal, or *external ring*, is formed by the divergent columns and cross fibres of the external oblique muscle and the pubes. Those fibres of the transversalis muscle which enter into the composition of the posterior wall of the inguinal canal are, as already stated, subject to considerable variety, being some-

times composed of muscle and tendon intermixed, and sometimes solely of tendinous fibres. They are, moreover, in some subjects more or less deficient, and sometimes altogether wanting; in which case the posterior wall is solely constituted by the internal aponeurosis.

f. The inguinal canal.—The oblique passage which transmits the spermatic vessels in the male, and the round ligament in the female, through the abdominal muscles, is named the inguinal canal. It commences at the internal, and terminates at the external, abdominal ring. Its anterior wall is formed entirely by the aponeurosis of the external oblique muscle, except at its upper part, where for a limited extent the lower fleshy edge of the internal oblique and transversalis muscles contributes to its formation. The posterior wall is formed by the tendinous and muscular fibres of the transversalis muscle, which, descending behind the spermatic sheath to be inserted into the pubic half of Poupart's ligament, are intimately incorporated with the internal aponeurosis (fascia transversalis). The posterior wall also frequently receives an augmentation of strength at its upper part from the lower tendinous fibres of the internal oblique, and, opposite the external ring, from a few fibres derived from the external oblique muscle of the opposite side, which have been described as the *triangular ligament* of the inguinal canal. The structures forming the posterior wall are, however, subject to great variety in their development. Frequently the tendon of the internal oblique does not descend so low as to contribute in any degree to its formation; the triangular ligament, in many instances, cannot be detected; and occasionally the transversalis muscle is at the same time so defective, that the wall is reduced to the thin layer formed by the internal aponeurosis. The inferior border of the canal is formed by Poupart's ligament; the superior is ill-defined, being simply constituted by the filamentous adhesion of the aponeurosis of the external oblique to the internal

oblique and transversalis above the spermatic sheath. The length of the canal is from one and a half to two inches, being rather greater in women than in men.

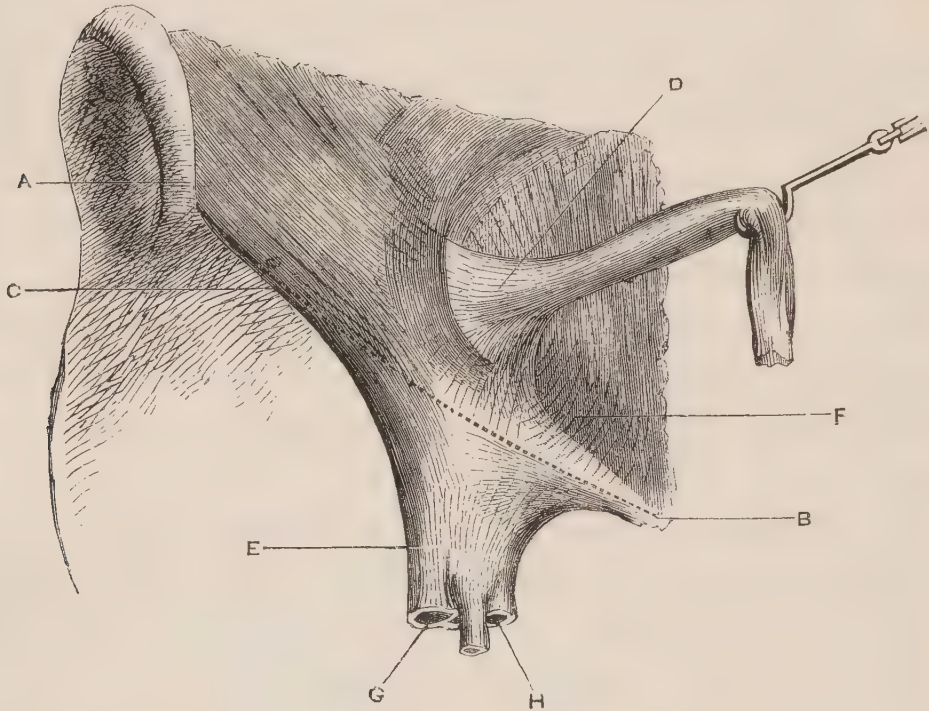
g. The internal aponeurosis.—The anterior portion of this membrane described by Sir Astley Cooper as the *fascia transversalis* (internal inguinal ligament of Hesselbach), lines the transversalis muscle, and furnishes a funnel-shaped process—the spermatic sheath,—which invests the spermatic vessels in their passage through the inguinal canal and scrotum. Conjointly with the iliac portion of the same membrane (*fascia iliaca* of other authors), it gives off a similar funnel-shaped process of larger size, which invests the femoral vessels in their passage behind Poupart's ligament.

h. The spermatic sheath is wide at its commencement, but is soon reduced to a smaller size, which it maintains throughout the inguinal canal and scrotum, becoming thinner as it descends until it reaches the testicle, where its tenuity is such as to render it difficult of detection. The mouth of the spermatic sheath is situated midway between the spines of the pubes and ilium, and is lodged within the internal ring, being surrounded by the lower border of the transversalis muscles, which has already been described as constituting this aperture.

The internal aponeurosis and its tubular processes vary considerably in strength, and in the arrangement of their fibres, in different persons. In the dissection from which the accompanying drawing (fig. 24) was taken, a distinct series of fibres were seen curving round the commencement of the spermatic sheath on its iliac side; between which and a subjacent layer the handle of the scalpel might, with very slight pressure, be insinuated for a few lines; but the further progress of the instrument was arrested by the superficial curved fibres becoming firmly incorporated with those of the deeper layer, which pursued a course nearly at right

angles with the former, and were prolonged into the spermatic sheath. On tracing the curving fibres downwards

Fig. 24.*



The anterior portion of the internal aponeurosis (*fascia transversalis*), with the spermatic and femoral sheaths.

towards Poupart's ligament, they became intimately incorporated with other fibres, which descended from the aponeurosis at the pubic side of the spermatic sheath, and which were blended with those of the transversalis muscle where it forms the posterior wall of the inguinal canal. Fibres thus descending from the aponeurosis at the iliac as well as at the pubic side of the sheath, formed conjointly a membrane which adhered firmly to Poupart's ligament, and was after-

* A. Anterior superior spinous process of ilium. B. Spine of pubes. C. Dotted line representing the situation of Poupart's ligament. D. Spermatic sheath drawn upwards towards the umbilicus. E. Femoral sheath. F. Some fibres of the transversalis muscle and its tendon intimately blended with those of the internal aponeurosis (*fascia transversalis*), and contributing to the formation of the posterior wall of the inguinal canal. G. Femoral artery. H. Femoral vein.

wards prolonged downwards behind it to form the anterior portion of the femoral sheath. In this instance, and in the majority of those which the author has examined, it was impossible to separate the aponeurosis into two distinct layers,—one, from the iliac side of the spermatic sheath, terminating in Poupart's ligament;* the other, from the pubic side, which alone was prolonged behind Poupart's ligament to form the anterior part of the femoral sheath. But in some subjects such separation may undoubtedly be observed; and the curved fibres are not only separable, as in the subject of the present drawing, at the iliac side of the spermatic sheath, but in some instances as low down as the pubes; and the handle of the scalpel, as Mr. Key has described, may be insinuated between them behind Poupart's ligament. As far, however, as the author has been able to observe, the separation can only be effected to a very limited extent, and the two layers soon become inseparably blended, and conjointly descend to form the anterior part of the femoral sheath. According to this description, the anterior part of the femoral sheath may be regarded as a general prolongation downwards of the anterior portion of the internal aponeurosis (fascia transversalis), and that fibres derived from that part of it which is situated on the iliac side of the spermatic sheath contribute to its formation as much as, if not more than, those derived from its pubic side.

i. The peritoneum.†—The peritoneum lining the lower part of the anterior wall of the abdomen, when viewed from within, presents two depressions, named the *inguinal fossæ*.

* According to the description of Sir Astley Cooper, the fascia transversalis consists of two portions: one, descending along the iliac side of the ring, sweeps downwards with a crescentic edge, and terminates in the entire length of Poupart's ligament; the other, descending along the pubic side of the ring, behind the former layer and Poupart's ligament, constitutes the anterior portion of the femoral sheath.

† This description has been taken principally from Cloquet, who has so well described the peritoneum in this region. See Translation of "Re-

These are separated from each other by a falciform partition, produced by a duplicature of small extent of the serous membrane, which supports the ligamentous remnant of the umbilical artery, as it passes obliquely upwards from the side of the pelvis and bladder towards the navel. The fossa on the iliac side of the ligament is the most extensive, and corresponds with the internal ring. The sac in oblique inguinal hernia is the peritoneum lining this iliac fossa. When the vaginal process of peritoneum remains pervious through the spermatic cord, it appears as a prolongation of the peritoneum of this fossa. The fossa on the pubic side corresponds with the external ring, and usually, but not invariably, furnishes the sac in direct inguinal hernia. It is separated from the pubic fossa of the opposite side by a fold of peritoneum situated in the median line, and containing the urachus. The umbilical ligaments (obliterated umbilical arteries) are subject to occasional varieties in their course, being sometimes situated so near to the pubes on each side that a direct inguinal hernia may occur on the iliac side. Occasionally they are so placed as to allow of a direct inguinal hernia occurring on each side of them in the same subject. Sir Astley Cooper has represented a remarkable instance of six direct inguinal herniæ in the same individual ; three on each side,—namely, two between the epigastric and the obliterated umbilical arteries, and one between the umbilical artery and the pubes.

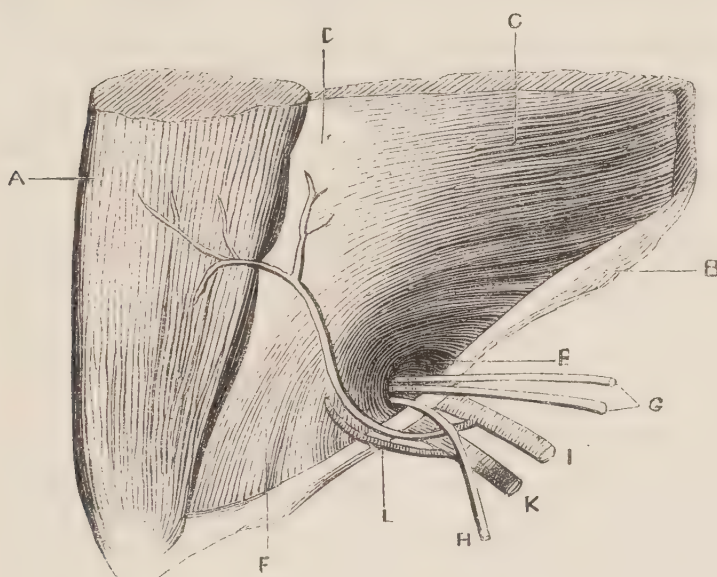
k. The subserous filamentous tissue.—The peritoneum, in the iliac and inguinal regions, is connected with the internal abdominal aponeurosis by loose filamentous tissue, which readily yields to the pressure of protruding viscera, allowing the peritoneum to be displaced by them, and accompanying it in its movements without laceration when the displacement is moderate. In corpulent persons this tissue is much loaded

cherches sur l'Anat. des Hernies par J. Cloquet," by Mr. M^cWhinnie ; and Lawrence, on Ruptures, p. 180, 4th edition.

with fat, which is often indurated, and, when protruded before the peritoneum, bears a close resemblance to omentum.

1. *The epigastric artery*.—The epigastric artery usually arises from the external iliac, a little above Poupart's ligament. It pursues its course through the loose subserous tissue, at first inclined a little downwards until it reaches the posterior surface of the femoral arch, then turning upwards it ascends obliquely behind the cord along the pubic border of the internal ring (see fig. 25), between the peritoneum and

Fig. 25.*



The internal ring seen from within, the internal aponeurosis (*fascia transversalis*) having been removed.

the internal aponeurosis (*fascia transversalis*), and, having reached the posterior surface of the rectus, penetrates the sheath of this muscle, and is expended in its substance. It is usually accompanied by two veins, which enter the iliac vein

* A. Rectus muscle. B. Poupart's ligament. c. Fleshy part of transversalis muscle. D. Tendinous portion of the same muscle. E. Internal ring. F. Posterior wall of inguinal canal, formed by transversalis muscle intermixed with fibres of internal aponeurosis. G. Spermatic artery and vein. H. Vas deferens. I. External iliac artery. K. External iliac vein. L. Epigastric artery and vein.

by a common trunk. The artery, near its origin, furnishes two or three small branches: one of which passes horizontally behind the pubes to the posterior surface of the rectus; the other, named by Sir A. Cooper the *cremasteric artery*, enters the inguinal canal, and is distributed to the cremaster muscle and the coverings of the testicle.

The epigastric artery frequently exhibits varieties in its course. In sixty-four instances examined by Hesselbach, it arose in thirty-five from the external iliac; in three from the femoral; in twenty-three by a trunk common to itself, the obturator, and the circumflexa femoris interna; and in one from the femoral by a trunk common to itself, the obturator, and the circumflexa ilii. Velpeau mentions one instance in which it arose in the thigh from the internal circumflex; and another, in which there were two epigastric arteries on the same side, one from the external, the other from the internal iliac; one was on the outer, the other on the inner side of the cord. Tiedemann has seen the epigastric arising from the profunda femoris.¹⁶¹

m. The spermatic cord.—The spermatic cord extends from the internal abdominal ring to the testicle. It is composed of the excretory duct of this gland, numerous blood-vessels, lymphatics, nerves, a ligamentous process of peritoneum, and subserous filamentous tissue. These different structures are enveloped in a tubular process of membrane, the spermatic sheath derived from the internal aponeurosis of the abdomen, and by a thin layer of muscular fibres, the cremaster.

α. The *vas deferens* commences at the epididymis, ascends along the back part of the cord, and, having traversed the inguinal canal, enters the abdomen, descends externally to the peritoneum, and terminates in the duct of the vesicula seminalis.

β. The arteries of the cord are the *spermatic*, the *deferential*, and the *cremasteric*. 1. The *spermatic artery* arises from the sides of the aorta between the superior and the

inferior mesenteric arteries a little below the renal. It descends obliquely behind the peritoneum, in front of the psoas muscle, and, on reaching the internal ring, meets at an acute angle the vas deferens, and, entering the inguinal canal, becomes one of the constituents of the cord. The artery descends to the epididymis and testicle surrounded by the spermatic veins.—2. The *deferential artery* arises from one of the branches of the internal iliac, and, after supplying a few small vessels to the vesicula seminalis, ascends along the vas deferens, adhering to it in its progress through the cord, and terminates in some branches which anastomose with the spermatic, and in others which are distributed to the cremaster and tunica vaginalis.—3. The *cremasteric artery* is derived from the epigastric, near the internal ring. It gives a branch to the rectus and pyriform muscles; and “a second, which descends upon the back part of the spermatic cord to the testis upon the cremaster muscle, to which it gives vessels in its course.” ¹⁶²

γ The *spermatic veins*, commencing in the testicle and epididymis, pass upwards in several groups to the lower part of the cord, where they form numerous anastomoses, and terminate in several branches, which surround the spermatic artery, traverse the inguinal canal, and, on reaching the abdomen, unite to form two or three vessels, which ascend in contact with the spermatic artery, and at length unite to form one trunk, which usually terminates on the left side in the left renal vein, and on the right in the vena cava.

δ. The *nerves*, more or less connected with the cord, which are distributed to the testicle and neighbouring parts, are the musculo-cutaneous and genito-crural branches of the lumbar plexus. The former is distributed to the skin of the groin, the upper part of the scrotum, and the root of the penis; the latter to the cremaster, and to the skin of the groin and fore-part of the thigh. The other nerves of the cord are filaments derived from the mesenteric, renal, aortic,

and hypogastric plexus of the sympathetic. They descend to the testicle in company with the blood-vessels.

ε. *The vaginal process of peritoneum.*—A delicate membranous band may generally be traced from that pouch or depression of the peritoneum, which we have already described as situated on the iliac side of the umbilical ligament, extending along the front part of the cord until it expands into the tunica vaginalis of the testicle. This band is the remnant of the tunica vaginalis of the cord, the canal of which is usually obliterated about the period of birth, but occasionally remains pervious, allowing a communication to exist between the cavity of the peritoneum and that of the serous envelope of the testicle.

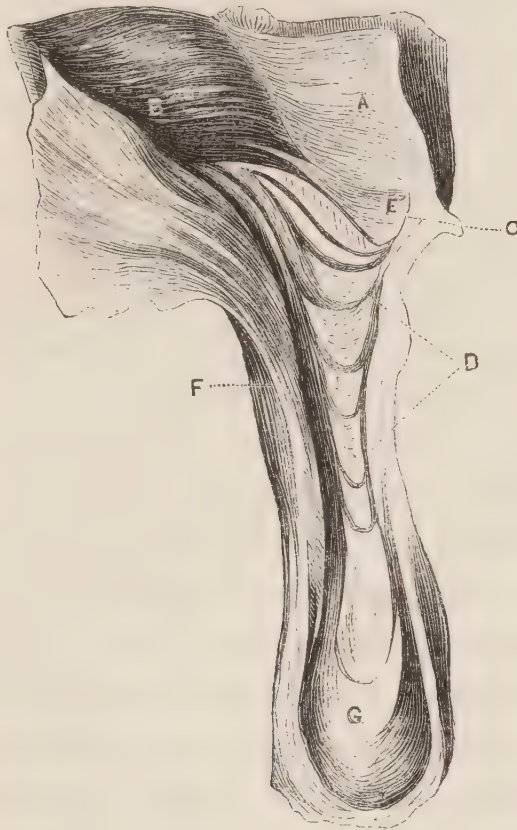
ζ. *The filamentous tissue of the cord* is directly continuous with the subserous tissue of the peritoneum. It connects the vascular and nervous constituents of the cord with each other, and with their investing sheath.

η. *The spermatic sheath*, as already described (see fig. 24), is a funnel-shaped prolongation of the internal aponeurosis (fascia transversalis), which constitutes an investment of the spermatic vessels from the internal ring to the testicle. In the inguinal canal this structure is always distinctly developed; but, as it descends to the neighbourhood of the testicle, it is much attenuated, and in some subjects is with difficulty recognized. It is united to the constituents of the cord through the medium of filamentous tissue.

θ. *The cremaster muscle* (fig. 26) is a layer of pale slender muscular fasciculi which invest the spermatic sheath and its contents. This layer of muscular fasciculi is attached to Poupart's ligament throughout the whole extent of the inguinal canal, to the pubes and sheath of the rectus muscle behind the superior pillar of the ring, and to the tunica vaginalis. The upper fasciculi arising from Poupart's ligament are of large size, being intimately blended at their origin with the lower fibres of the internal oblique, and pursuing

their course towards the pubes in front of the cord nearly parallel to the lower edge of the internal oblique, but usually

Fig. 26.*



Cremaster muscle.

separated from it by a little filamentous tissue. The fibres below assume a curved direction as they pass from Poupart's ligament to the pubes, forming a succession of curves, which become more and more acute the lower they descend in front of the cord and tunica vaginalis, whilst the lowest of the fasciculi connected with Poupart's ligament and the pubes descend laterally along the cord to be attached to the tunica vaginalis by minute tendinous insertions, their continuity so as to constitute loops not being demonstrable. A few fasciculi, pur-

* A. Aponeurosis of external oblique muscle. B. Internal oblique muscle. c. Rectus muscle. D. Cremaster. E. Attachment of cremaster to the pubes and sheath of the rectus. F. Spermatic fascia laid open. G. Testis enclosed in the tunica vaginalis.

suing their curved direction from Poupart's ligament to the pubes, may generally be observed on the posterior surface of the cord.

2. *The descent of the testicle.*

The testicle, when first formed, is situated in the abdomen a little below the kidney, and near the origin of its own artery. It soon begins to descend, and about the fifth or the sixth month of fetal life is usually placed upon the lower part of the psoas muscle, invested anteriorly and laterally by peritoneum, and posteriorly uncovered for the passage of the vessels and nerves. From the lower end of the testicle and epididymis proceeds the gubernaculum, a fibrous band covered, like the testicle, anteriorly and laterally by peritoneum. The gubernaculum may be traced from the testicle through the inguinal canal into the scrotum; and the peritoneum in connexion with it is observed to form a small pouch, which projects into the commencement of the inguinal canal. The testicle gradually descends in the abdomen, and, guided as it were by the gubernaculum, enters the pouch of peritoneum lying in the upper part of the inguinal canal. The testicle, protruding before it the peritoneal pouch, gradually traverses the inguinal canal, and, at the completion of the eighth month, has usually reached the scrotum, having carried with it an elongated pouch of peritoneum. Soon after the descent of the testicle is completed, the neck of the peritoneal pouch usually becomes closed by adhesion, and the testicle remains invested in a distinct serous bag—the tunica vaginalis—which now no longer communicates with the general cavity of the peritoneum.*

The descent of the testicle is liable to interruption from various causes. Instead of reaching the scrotum before the

* For Mr. Curling's views respecting the descent of the testis, see Gubernaculum, p. 310.

birth of the infant, the process may be delayed to a later period, or may be permanently interrupted. Wrisberg,¹⁶³ having dissected 103 foetus at the full term, ascertained that in 73 both testicles had descended into the scrotum, in 11 the right testicle only had descended, in 7 the left only, and in 12 neither testicle had descended. Of the 12 in which the testicles had not descended before birth, in 1 the descent occurred on the day after birth, in 3 on the second day, in 3 on the third, in 2 on the fifth, and in 1 on the twenty-first day. In the other instances the testicles had not appeared at the fourth or fifth week.¹⁶⁴ Dr. Marshall,¹⁶⁵ having examined 10,800 recruits, found 5 in whom the right, and 6 in whom the left testicle was not apparent. He met with only one instance in which neither of the testicles had descended. Mr. Curling¹⁶⁶ states, that, in 20 cases examined at different ages from five to sixty, in 10 the imperfection was on the left, and in the same number on the right. Mr. Hunter¹⁶⁷ was of opinion that the completion of the descent, when it has been delayed beyond the natural period, most frequently occurs between the years of two and ten.

The causes which interfere with the natural descent of the testicle are various. In an infant, which had only one testicle in the scrotum, and died a few hours after birth, Wrisberg¹⁶⁸ found the opposite gland close to the ring, and connected to the omentum by means of three slender filaments. In the body of an old man, M. J. Cloquet¹⁶⁹ found the left side of the scrotum empty: the testicle was placed between the psoas and iliac muscles an inch above the upper opening of the inguinal canal; the epididymis held its proper relative position to the testicle, but its upper end was connected to the sigmoid flexure of the colon by a strong, short, and rounded fibrous cord. Small size of the external ring is in many instances a probable cause of the imperfect descent. This opinion Mr. Wilson¹⁷⁰ considered to be supported by

the fact, that the testicle is more frequently found in the inguinal canal than in the abdomen. Mr. Curling¹⁷¹, regarding the gubernaculum as constituted for the most part by the fetal cremaster, supposes that the imperfect descent may sometimes be the result of deficient power in this muscle, either from its being imperfectly developed, or from being paralyzed or scantily supplied with nervous energy.

The time of closure of the neck of the tunica vaginalis is subject to considerable variation. The canal is not unfrequently open at the time of birth; and in some subjects it remains pervious throughout the whole of life. According to the observations of Camper,¹⁷² the canal is generally open at the time of birth. He dissected 70 new-born children, and found that both testicles had descended into the scrotum in 63. In 34 of these the vaginal canal was open on both sides, in 14 it was open only on the right, and in 8 only was it open on the left; but in 7 it was closed on both sides.

The canal sometimes remains open for many years without the occurrence of hernia. Hesselbach found it open on both sides in a man thirty-eight years of age, who had never experienced any protrusion of the abdominal viscera. Hernia of the tunica vaginalis has in many instances occurred suddenly from violence at the adult age.

The process of closure of the vaginal canal is often imperfect. In the normal condition the obliteration of the canal extends throughout the whole funicular portion of the tunica vaginalis, or, in other words, from the abdomen nearly to the testicle. But in many instances this process is far from being complete. M. Cloquet¹⁷³ has minutely described these irregularities, some of the most important of which will be briefly noticed. The canal may be interrupted only at one point, leaving a tubular sac open to the abdomen. It may be adherent at two points, leaving an intervening serous cyst; or at several points, with numerous intervening cysts. The influence of these irregularities in determining the pecu-

liar forms of hernia of the tunica vaginalis, and the complications of other inguinal herniæ with hydrocele of the tunica vaginalis, will hereafter be considered.

The *gubernaculum* * is described by Mr. Curling,¹⁷⁴ whose views respecting the cremaster muscle are entitled to much weight, as “ a soft solid projecting body of a conical form, which varies somewhat in shape and size at different periods of the testicular descent, becoming shorter and thicker as the gland approaches the abdominal ring. It is situated in front of the psoas muscle, to which it is connected by a reflexion of peritoneum. Its upper part is attached to the inferior extremity of the testis, lower end of the epididymis, and commencement of the vas deferens. The lower part of this process passes out of the abdomen at the ring, and, diminishing in substance and spreading, terminates in three processes, each of which has a distinct attachment. The central part and bulk of the gubernaculum is composed of a soft, transparent, gelatinous substance, which, on examination in the microscope, is found to consist of nucleated cells, the primitive cellular tissue: this central mass is surrounded by a layer of well-developed muscular fibres, which may be distinguished by the naked eye, and which can be very distinctly recognized in the microscope to be composed of ‘ striped elementary fibres.’ These muscular fibres, which may be traced the whole way from the ring to the testis, are surrounded by a layer of the soft elements of the cellular tissue similar to that composing the central mass; and, in the same way as the testis, the whole process, except at its posterior part, is invested with peritoneum. On carefully laying open the inguinal canal, and gently drawing up the gubernaculum, the muscular fibres may be traced to the three processes, which are

* “ This ligament (the gubernaculum) is evidently vascular and fibrous, and seems in part to be composed of the cremaster muscle turned inwards.” —B. Bell, Syst. of Surgery, vol. v. p. 264. See Jno. Hunter, in Dr. Hunter’s Medical Commentaries.

attached as follows : the external and broadest is connected to Poupart's ligament in the inguinal canal ; the middle forms a lengthened band, which escapes at the external abdominal ring, and descends to the bottom of the scrotum, where it joins the dartos ; the internal passes in the direction inwards, and has a firm attachment to the os pubis and sheath of the rectus muscle. Besides these, a number of muscular fibres are reflected from the internal oblique on the front of the gubernaculum. It thus appears that the attachments of the muscle of the gubernaculum, and those of the cremaster in the adult, are exactly similar. I have succeeded in tracing out the former before the testis has descended, at different stages of the process, and immediately after its completion ; and of the identity of the two no doubt can be entertained."—" In the passage of the testis from the abdomen to the bottom of the scrotum, the gubernaculum, including its peritoneal investment and muscular fibres, undergoes the same change as that which takes place in certain of the Rodentia at the access of the period of sexual excitement ; the muscle of the testis is gradually everted, until, when the transition is completed, it forms a muscular envelope external to the process of peritoneum, which surrounds the gland and front of the cord. As the testis approaches the bottom of the scrotum, the gubernaculum diminishes in size, owing to a change in the disposition of its cellular elements : the muscular fibres, however, undergo little or no diminution, and are very distinct around the tunica vaginalis in the recently descended testis. The mass composing the central part of the gubernaculum, which is so soft, lax, and yielding as in every way to facilitate these changes, becomes gradually diffused ; and, after the arrival of the testis in the scrotum, contributes to form the loose cellular tissue which afterwards exists so abundantly in this part : the middle attachment of the gubernaculum, which may be traced to the dartos at the bottom of the scrotum, gradually wastes away, and soon be-

comes indistinct, though slight traces of this process often remain to the latest period of life.”—“ Now, when we consider the attachments and connexions of this muscle in the foetus, the perfect condition of its fibres as ascertained by microscopical examination, and the circumstance that there are no other means, no other motive powers by which this change can be effected, or in any way promoted, I think there is no reason to doubt that the cremaster executes the same office in the human embryo as that which it undoubtedly performs in certain animals at a particular season. The fibres proceeding from Poupart’s ligament, and the obliquus internus, tend to guide the gland into the inguinal canal; those attached to the os pubis, to draw it below the abdominal ring; and the process descending to the scrotum, to direct it to its final destination. As the descent approaches completion, the muscular fibres which perform so important a part in it gradually become everted, and, instead of drawing down the testicle, acquire the new functions of elevating, supporting, and compressing it.”

This ingenious and comprehensive exposition of the structure of the gubernaculum and its functions by Mr. Curling is most satisfactory, and clearly shews that the hypothesis of Cloquet—which assumes that the cremaster does not exist before the descent of the testicle, but that it is formed mechanically, by the testicle pushing before it the lower fibres of the internal oblique, so as to form the loops of which he says it is composed—is altogether untenable. John Hunter¹⁷⁵ had previously described the gubernaculum as a ligament, vascular and fibrous, which is “ covered by the fibres of the cremaster ;” and Sir Astley Cooper¹⁷⁶ states, “ the cremaster, as I can distinguish it in the foetus, passes upon the gubernaculum to the epididymis and testis, and is attached to the process of peritoneum which descends with the testis as a pouch to the lower part of the inguinal canal.” Hunter was also aware that the cremaster was capable in some animals of

drawing down the testicle from the abdomen into the scrotum at the period of sexual excitement, but he failed to carry the analogy to the human subject. To Mr. Curling attaches the merit of having proved by the microscope that a great portion of the gubernaculum consists of muscular fibres; that its attachments are identical with those of the cremaster; and that through the agency of this structure, which must be regarded as the fetal cremaster, the descent of the human testicle is accomplished.

3. *Peculiarities in the female.*

The principal anatomical peculiarity in the region of inguinal hernia in the female results from the substitution of the round ligament for the spermatic cord and the testicle. The *round ligament* arises from the fundus of the uterus, extends through the inguinal canal, and terminates in the fat and integument of the pubes. At the internal ring it receives a delicate tubular sheath from the internal aponeurosis (fascia transversalis), which invests it through the greater part of its course. In some subjects a small tubular process of peritoneum enters the inguinal canal, and accompanies the round ligament for a short extent of its course. This vaginal process of peritoneum occasionally remains pervious throughout the whole of life, and has been named, after the anatomist who discovered it, the *canal of Nuck*. As the round ligament is smaller than the spermatic cord, so the inguinal canal in females is narrower, and the external ring smaller.

The length of the canal is also somewhat greater, in consequence of the aperture of the external ring not extending so far from the pubes as in men.

4. *Statistics and causes of inguinal hernia.*

a. Age appears to exert a decided influence upon the production of inguinal hernia; or, in other words, this species of hernia is more prone to occur at certain periods of life than

at others. M. Malgaigne found 300 inguinal herniæ to date their origin in the following order :

From birth to	1 year	.	.	.	.	22
„	1 to 5 years	.	.	.	.	7
„	5 to 10	„	.	.	.	15
„	10 to 20	„	.	.	.	26
„	20 to 30	„	.	.	.	45
„	30 to 40	„	.	.	.	66
„	40 to 50	„	.	.	.	42
„	50 to 60	„	.	.	.	36
„	60 to 70	„	.	.	.	30
„	70 to 89	„	.	.	.	11
						<hr/> 300

Soon after birth inguinal herniæ are of frequent occurrence, but diminish rapidly in number until the age of eight or ten years. The herniæ of this epoch may be denominated the *herniæ of infancy*, and, with few exceptions, are herniæ of the tunica vaginalis. From the age of ten to thirty-five years, the number of herniæ is decidedly but gradually increased. The herniæ of this period may be termed the *herniæ from violence*, as they are chiefly attributable to the active muscular exertions which attend the sports and occupations of youth and early manhood. From thirty-five years to extreme old age there is a great increase in the number of inguinal herniæ, in consequence of the operation of those causes which produce relaxation of the abdominal muscles: hence the herniæ of this epoch may be styled *herniæ from debility*.

b. Tall stature exerts an obvious influence upon the production of inguinal hernia. M. Malgaigne found this disease more frequent in persons of tall than of short stature, and he imputes the occurrence to debility. In confirmation of this opinion it is stated, that those regiments which consist of men of high stature furnish a greater proportion of invalids than those which are composed of short persons; the latter being more capable of bearing protracted exertion and fatigue, and less influenced by morbid causes.

In accordance with this opinion, it was ascertained that herniæ in tall persons shew a large proportion originating after thirty-five years of age, when herniæ from debility more especially appear. Thus, in 15 subjects under the height of five feet, the herniæ occurred in 11 before the age of forty, and in 4 only after that age; whereas, of 63 subjects of five feet two inches and above, 33 only had herniæ before the age of forty, and 30 after it.

The tables referred to on the general statistics of hernia render it evident that inguinal herniæ are much more frequent on the right than on the left side. This frequency on the right side has been imputed to the general predominant power of the muscles of the right side of the body,—the majority of mankind being in consequence thereof termed right-handed. M. Cloquet has observed, that when we employ the right arm in carrying a weight, dragging, and in most considerable efforts, the chest is inclined towards the left, and the diaphragm pushes the viscera towards the right abdominal muscles. Consequently, in these efforts, hernia is more likely to occur on the right side. But M. Malgaigne has shewn that this statement is not universally correct, for, when a person exerts the right arm to raise a heavy weight from the ground, the viscera are pushed most forcibly against the left abdominal muscles; but when he has raised the weight, and endeavours to place it on his right shoulder, or the head, the viscera are pushed against the right abdominal wall.

It may, however, be stated generally, that the muscular efforts of right-handed persons have a greater tendency to produce herniæ on the right side, whilst those of left-handed persons have a greater tendency to their production on the left side. Thus, of 136 right-handed persons examined by Malgaigne, 91 had inguinal herniæ on the right, and 45 only on the left side; and, of 17 left-handed individuals, 10 had it on the left, and 7 only on the right side. But this explanation upon the principle of unequal muscular pressure is insuf-

ficient to account for the preponderance of right inguinal herniæ in infants, for their muscular efforts in crying are exerted with equal force on both sides of the body. Wrisberg¹⁷⁷ dissected 103 new-born infants, 2 of whom had inguinal hernia. The disease in both subjects occurred on the right side, and evidently resulted from adhesion of the testicle to the intestine; for, on replacing the intestine, the testicle in each case was drawn up towards the ring. It may be presumed that there exists some special anatomical predisposition, independently of the cause which operated in the cases of Wrisberg, which determines the more frequent occurrence of inguinal hernia on the right side of infants; but what this cause is, cannot at present be satisfactorily decided. M. Malgaigne¹⁷⁸ supposes it to be the more frequent patency of the vaginal process of peritoneum on the right than on the left side. But, as before stated, the patency of this canal may determine the variety of inguinal hernia; or, in other words, if inguinal hernia do occur, it may cause it to assume the form of hernia of the tunica vaginalis, rather than of oblique inguinal hernia: but it may be doubted whether it can be regarded as an efficient cause of inguinal hernia in general. We must rather look for some cause which operates by producing at least a temporary weakness of the muscular and aponeurotic structures of the inguinal region, or dilatation of the inguinal canal. It is not improbable that this condition may hereafter be shewn to depend upon the time of descent of the right testicle, and the dilatation of the inguinal canal consequent upon its recent descent.

Double inguinal hernia is of very frequent occurrence. Of 316 hernial subjects examined by M. Malgaigne, 133 had single, and 186 double herniæ. So great is this tendency to double herniæ, that, without being able to assign the anatomical cause of it, we may regard the existence of inguinal hernia on one side as indicating a predisposition to it on the other. A knowledge of this fact will point out the

propriety of the more frequent employment of double trusses, not merely as palliative or remedial measures, but as preventive ; more especially when the hernia may be termed spontaneous, from its occurring without any obvious accidental cause. The longer one hernia has existed without the formation of a second, the greater is the probability that a second will not occur.

CHAPTER II.

VARIETY I. OBLIQUE INGUINAL HERNIA.

Synonym. EXTERNAL INGUINAL HERNIA.

OBLIQUE inguinal hernia is a protrusion of the abdominal viscera into the sheath of the spermatic vessels. Invested by this delicate membrane, the protruded structures traverse more or less completely the inguinal canal, and frequently project through the external ring, and in some cases even into the lower part of the scrotum.

This variety of inguinal hernia is so named from the direction of the hernia corresponding to the oblique course of the inguinal canal. With equal propriety hernia of the tunica vaginalis might receive the same appellation, but, in accordance with common usage, the term will here be restricted to that variety of inguinal hernia which is situated within the spermatic sheath.

When the hernia has not projected beyond the external ring, it has been named *incomplete*. It would, however, be more correctly designated *interstitial*, after the example of Royer and other French authorities.

In its earliest stage, oblique inguinal hernia appears as a visceral projection, of a hemispherical form, usually pushing before it the peritoneum into the sheath of the spermatic vessels, and embraced by the lower fibres of the transversalis muscle, which constitute the internal ring. As the protrusion advances, it gradually projects beyond the lower edge of the internal oblique muscle, and occupies the upper

portion of the inguinal canal. The disease, in these early stages, being rarely attended by external swelling, generally escapes the observation of the patient, and has frequently, even in the strangulated state, been overlooked by the medical attendant. Hence it is incumbent upon the surgeon to investigate with the utmost care the site of the internal ring, whenever the symptoms of intestinal obstruction exist without the cause of the obstruction being apparent. By neglect of such attention, many patients have died from strangulated hernia, who were supposed to be suffering from simple enteritis.

When the hernia, in this early period of its development, is strangulated, the site of the internal ring is hard, resisting, and painful to the touch, and may be recognized by a slight though visible elevation or fulness of the part which is not observable on the opposite side. As the patient is seldom aware of the existence of the hernia in this stage, the surgeon is rarely consulted in the case, unless strangulation exists, and its attendant symptoms have excited alarm. On this account, the surgeon rarely has his attention directed to the reducible stage of the disease. But he may, nevertheless, have frequent opportunities of witnessing the affection, if, when consulted for a scrotal hernia, he examine the inguinal region of the opposite side. He will thus, as noticed by M. Malgaigne, from the great tendency to the existence of double herniæ, have many opportunities of detecting an unsuspected interstitial hernia. In such a case, an unnatural degree of impulse on coughing may be perceived at the internal ring, and even a slight fulness of the part is visible. The patient usually experiences a sense of weakness at the ring, accompanied by sensations of dragging and pain in the loins and hips, more or less distressing.

As the disease advances, the protrusion assumes a more elongated form, and gradually fills the whole inguinal canal, when it is attended with a more obvious swelling, usually slight,

of an oblong or oval form, situated a little above Poupart's ligament, its direction corresponding with that of the inguinal canal. Occasionally the disease, although still limited to the canal, attains considerable magnitude, separating the external from the internal oblique to a great extent, and forming a prominent external tumour. I have lately operated upon a hernia of this description, which reached nearly as far as the anterior superior spinous process of the ilium.

In a still further stage of the disease, the tumour projects through the external ring, and, progressively enlarging, descends along the course of the spermatic cord towards the lower part of the scrotum. If the inguinal canal be now examined, it will appear to be occupied by a swelling, usually of an oblong form, which is separated from the more prominent scrotal portion of the tumour by a slight contraction in the situation of the external ring.

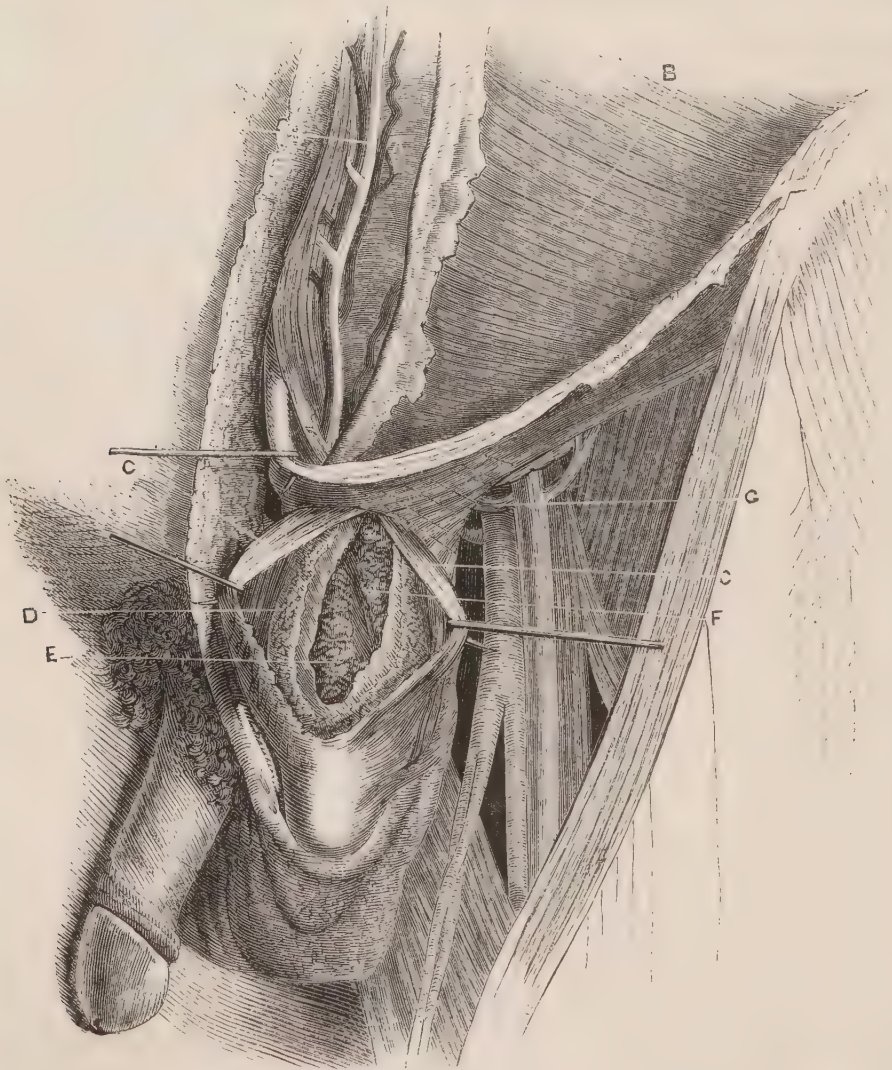
The sac of oblique inguinal hernia, while in the spermatic sheath, is imbedded in the filamentous tissue which unites the spermatic vessels to each other and to the sheath, and which is continuous with the subserous tissue of the abdomen. This tissue constitutes also the subserous layer of the sac, which is usually of great delicacy, but in old herniæ is often increased in thickness and tenacity by the infiltration and subsequent organization of lymph. It forms, therefore, the most internal investment of the sac, connecting the latter to the sheath, with which it forms that compound covering of oblique inguinal hernia to which the name of *tunica propria* is usually given. The external surface of the spermatic sheath has a smoothish and somewhat polished aspect, and has, on this account, been sometimes mistaken for the sac itself.

The hernia, invested by the sac, subserous tissue and spermatic sheath (*tunica propria*), rests against the posterior wall of the inguinal canal, at the abdominal extremity of which it is nearly surrounded by the inferior fibres of the transversalis muscle which form the internal ring; and, a little lower down,

the inferior edge of the internal oblique muscle arches over the tumour with a more gradual curve, from which, and from Poupart's ligament, the fibres of the cremaster descend chiefly over the front and lateral parts of the spermatic sheath, giving an additional investment to the hernia. Still more externally, the interstitial portion of the tumour is covered by the aponeurosis of the external oblique, superficial fascia, and skin.

When the hernia has escaped from the external ring and

Fig. 27.



Oblique inguinal hernia.—After Scarpa.

A. Poupart's ligament. B. Internal oblique muscle. C. Cremaster. D. Sheath of spermatic vessels. E. Peritoneal sac. F. Omentum. G. Epigastric artery.

has become scrotal, the sac is still covered by the subserous tissue, the sheath of the spermatic vessels, and the cremaster; but, instead of being bound down by the aponeurosis of the external oblique, it is enveloped by the more yielding spermatic fascia, which invests the cord, and is prolonged from the borders of the external ring. In addition to these, the hernia is covered by the filamentous tissue, the scrotum, the dartos, and skin.

1. *Changes in the relative position of the rings, and in the envelopes from old scrotal herniæ.*—Whilst the hernia remains interstitial, the envelopes undergo but little change of structure; but, after it has long been scrotal, they frequently exhibit many important alterations. The sac may become opaque and thickened, although it often remains remarkably free from pathological change, even after the structures external to it have been greatly altered. The neck of the sac is most liable to alteration, being frequently the seat of a new fibrous change, by which it is rendered firm and unyielding; but occasionally a similar transformation may also occur in the body of the sac, or at the mouth of supplementary pouches. The subserous tissue is often converted into a thick firm opaque membrane, divisible into several layers. The cremaster frequently exhibits its fasciculi much enlarged, and of a deeper red colour than natural; or it may have altogether lost its muscular character, being converted into a dense, pale-coloured, fasciculated membrane. The spermatic fascia becomes thickened, indurated, and opaque.

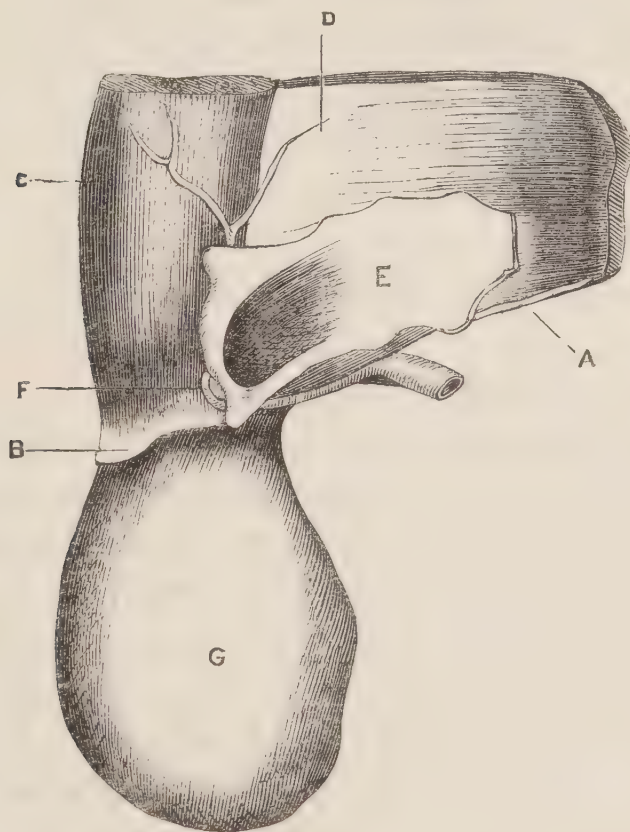
In large herniæ, from the weight, and consequent dragging of the protruded viscera, the internal ring becomes greatly dilated; and as the direction of the weight is inwards, or towards the mesial line, the pubic border of the ring is the one which yields to the greatest extent: or, in other words, the enlargement of the internal ring, from the weight and dragging of the protruded viscera, is principally at the expense of its internal or pubic border; though the external or

iliac border also becomes distended somewhat, from the pressure of the increased mass of the hernial contents. The internal ring is thus made to descend towards the external ring, and, in old and very large herniæ, very nearly reaches it, thus altering the course of the canal from an oblique to a straight direction, by which it is necessarily reduced in extent; though its walls acquire considerable thickness, from the consequent aggregation and close impaction of the structures entering their formation. A large hernia also pushes upwards the inferior edge of the internal oblique muscle, giving to it a more decided curve than natural, and condensing its fibres so that it forms a thick firm muscular band, arching over the hernia a little below the internal ring. The external ring likewise undergoes considerable change, losing its triangular form, and becoming rounder and larger, chiefly in consequence of the extension of its superior and iliac borders. The intercolumnar fibres, moreover, as well as those which form the superior pillar of the ring, being displaced and forced into closer order, give to the upper and iliac borders of the external ring a much stronger and more definite outline than they possess in the natural condition of the parts. This alteration of the external ring co-operates with the changes already referred to at the internal ring, in bringing the two apertures still more opposed to each other, and in thus producing the result there described.

As the *epigastric artery*, in the normal condition of the parts, winds along the inferior and pubic borders of the internal ring in its oblique course towards the rectus muscle, so it maintains the same relative position to the neck of the hernial sac at the internal ring. The epigastric vessels, therefore, are found in close proximity to the inferior and pubic borders of the neck of the sac; and as the pubic border of the ring is displaced towards the median line as the hernia increases in volume and direction, so in like manner and direction the epigastric artery is displaced, descending for some distance along

the inferior border of the ring, and then turning abruptly upwards to pursue a vertical course along the *pubic* border of the ring, nearly parallel to the rectus muscle. This alteration in the course of the epigastric artery has been well delineated by Sir Astley Cooper¹⁸⁰ and Hesselbach.¹⁸¹ In the natural state, the epigastric artery ascends about two and a half inches distant from the symphysis of the pubes, and in large herniæ it has been known to approach within three quarters of an inch.¹⁸² But, notwithstanding this change of course, it still maintains the same *relative* position to the neck of the sac, ascending along its pubic border.

Fig. 28.*



Epigastric artery displaced towards the pubes by an oblique inguinal hernia.—Leeds School of Medicine.

* A. Poupart's ligament. B. Pubic attachment of Poupart's ligament. C. Rectus muscle, its sheath removed. D. Transversalis muscle, the internal aponeurosis having been removed. E. Mouth of the sac. F. Epigastric artery displaced towards the pubes. G. Hernial sac.

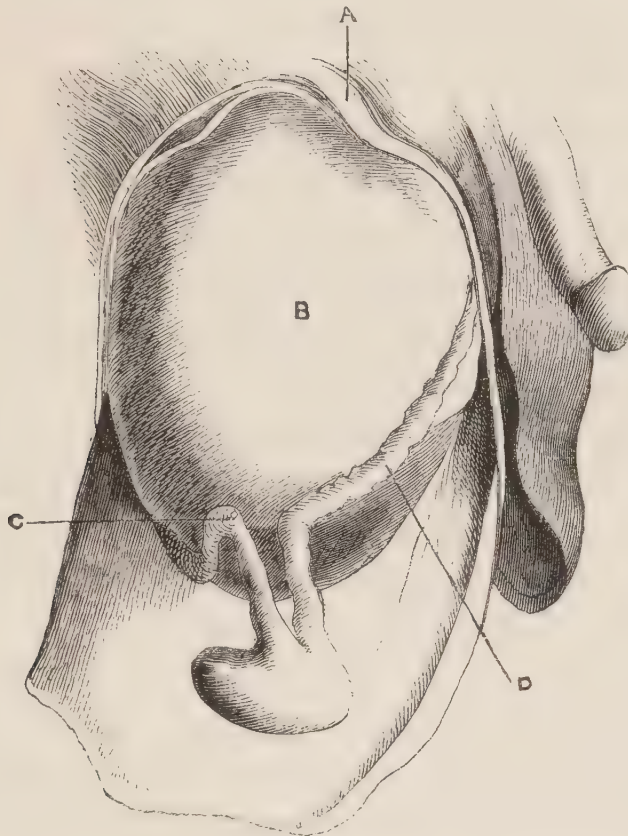
2. *Separation of the elements of the spermatic cord by old herniæ.*—The sac of oblique inguinal hernia, on its entrance into the spermatic sheath, is placed in front of *the spermatic vessels*; and the hernia, in descending through the inguinal canal and scrotum, usually maintains the same relative position to the spermatic vessels; but in old scrotal herniæ exceptions are frequently observed, the vas deferens being detached from the blood-vessels, and these parts pursuing separate courses along the sides, or in front of the sac.

When the constituents of the cord are thus separated, they present several varieties in their course. Occasionally the vas deferens passes on one side of the sac, and the spermatic blood-vessels on the other.¹⁸³ In some instances these vessels approach each other in front of the lower part of the sac, and pass conjointly¹⁸⁴ to the testicle, which has been known to lie in front of the hernia; in others, again, the blood-vessels pass in front of the sac, and the vas deferens behind it;¹⁸⁵ and, lastly, in some few instances, the blood-vessels have been situated posteriorly, while the vas deferens has been found in front, and has even been divided, while in this situation, in the operation for strangulated hernia.¹⁸⁶

The separation of the constituents of the cord rarely occurs when the hernia has descended rapidly. But when it has been long delayed in the inguinal canal, and has there attained considerable magnitude, the sac, being firmly united by filamentous tissue to the vessels and nerves during its increase, gradually separates these structures from each other, as shewn by Scarpa; and, when it afterwards descends into the scrotum, it still keeps them separated, and has occasionally even penetrated between them, so that its inferior part is actually placed behind the vessels, and even behind the testicle itself.¹⁸⁷ The separation of the constituents of the cord rarely occurs, except in large herniæ; but it does occasionally, inasmuch as Sir A. Cooper witnessed its occurrence even in a hernia of small size, the blood-vessels in this

case passing in front of the tumour, and the vas deferens behind it.

Fig. 29.*



Elements of spermatic cord separated by an oblique inguinal hernia.—After Scarpa.

A knowledge of these varieties in the relations of the sac to the cord and its constituents, will shew the importance, in operating for strangulated inguinal hernia, of carefully dividing the different envelopes in succession. By neglect of this precaution, the vas deferens has been injured, or even divided, than which there are few accidents more to be deplored. It also shews the propriety, in large herniæ, of limiting the division of the envelopes to their upper part, on account of the separated vas deferens and spermatic vessels sometimes re-uniting in front of the hernia at its lower part.

* A. External abdominal ring. B. Sac of an oblique inguinal hernia.
C. Spermatic artery and vein. D. Vas deferens.

The pressure of the hernial tumour upon the spermatic veins may now and then produce a degree of varicocele. The impeded return of venous blood also favours the production of hydrocele, which is most likely to occur in old subjects affected with large hernia. From the same causes the testicle and epididymis are occasionally hypertrophied.

3. *Comparative frequency of this variety in women.*—*Oblique inguinal hernia* occurs in women after the age of twenty, but rarely before that age. The period of infancy is undoubtedly the one in which inguinal hernia is found most frequently in females; but, at this time, the variety is analogous to that of the tunica vaginalis in males.

M. Malgaigne* maintains, that, even in adult and aged females, inguinal hernia occurs more frequently than femoral; and that the opposite opinion, which has so extensively prevailed, has arisen from defective diagnosis. He admits that femoral herniæ in this sex more frequently require operation than inguinal; but, at the same time, he maintains that this fact only proves the greater tendency of femoral hernia to become strangulated. M. Malgaigne observes, that the herniæ occurring at the groin in female infants are almost exclusively inguinal, and that before the age of twenty femoral hernia is extremely rare; but although after this age both inguinal and femoral occur, yet that there is no period of life in which the latter predominate.

The round ligament in females, like the spermatic vessels in males, receives a funnel-shaped prolongation or sheath from the internal aponeurosis (fascia transversalis). Into this sheath the oblique inguinal hernia of females descends, traversing more or less completely the inguinal canal, or protruding beyond the external ring, and even descending into the labium. Whether the disease be interstitial or labial, it bears the same relations to the inguinal canal, the abdominal

* Page 172.

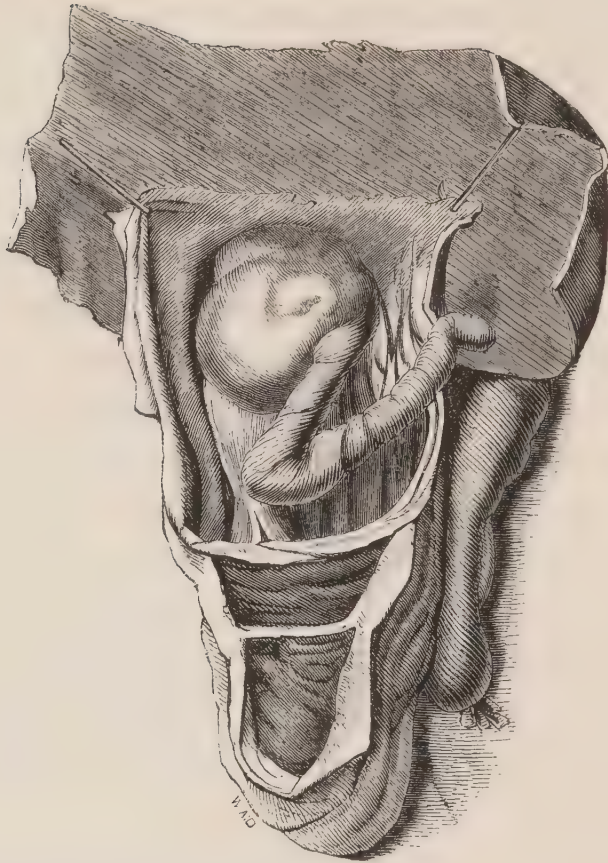
rings, and the epigastric artery, as in man; but differs from the hernia of males in having the round ligament placed behind it, instead of the spermatic vessels. The envelopes are the same as in man, except that there is no cremaster, and that the sheath which invests the round ligament is of greater tenuity than that which invests the spermatic vessels. So delicate is this layer, that it is of no practical importance in the operation for strangulated hernia; during which it is usually confounded with the subserous tissue.

From the smaller size of the external ring in women, oblique inguinal hernia is more liable to remain interstitial than in men; and, from the greater accumulation of fat in the integuments of the lower part of the abdomen, it is more likely to be overlooked. When the disease has become labial, the obliquity of the upper part of the tumour is not so frequently effaced by descent of the internal ring as in man, and the constriction formed by the external ring is generally more strongly marked.

Mr. Allan Burns¹⁸⁸ has described a remarkable peculiarity, which is occasionally observed in oblique inguinal hernia after it has escaped from the external ring. He has shewn, that, instead of descending obliquely into the labium or scrotum, it sometimes *turns directly downwards into the bend of the thigh*, so as to occupy a position resembling that of femoral hernia. Mr. Burns witnessed five instances of this peculiarity in the female, and ascertained that it was owing to the columns of the external ring being separate to a greater extent towards the ilium than natural, in consequence of deficiency of the intercolumnar fibres.

The *viscera* most frequently *protruded* in oblique inguinal hernia are the ileum, the transverse colon, and the omentum; occasionally the cæcum (fig. 30), the sigmoid flexure of the colon, and the urinary bladder. When the latter organs constitute the hernia, they give rise to some important peculiarities which have already been described.

Fig. 30.



Inguinal hernia in which the cæcum is the protruded part.—After Scarpa.

4. *Complications of this variety.*—Oblique inguinal hernia is occasionally accompanied by other herniæ. Wilmer¹⁸⁹ has related a case in which this affection co-existed with hernia of the tunica vaginalis. Both herniæ were strangulated. The latter was released by operation, while the former was overlooked; and the real character of the disease was only ascertained on dissection. Similar instances of complication are related by Arnaud, Sandifort, Brugogne, and Masselin.¹⁹⁰

Mr. Lawrence¹⁹¹ observes, that oblique and direct inguinal hernia may co-exist on the same side, and that these two may occur in conjunction with femoral hernia of the same side.

My colleague, Mr. Smith, lately directed my attention to

a man in the Leeds Infirmary who had an inguinal and a femoral hernia on both sides of the body.

Hernia frequently co-exists with *hydrocele of the tunica vaginalis*. The latter may be situated either below the hernia, or behind, or in front of it. When the hydrocele is placed anteriorly to the hernia, an important complication of the latter is produced, which has frequently been described as hernia infantilis, or encysted hernia of the tunica vaginalis. This subject will be more fully considered hereafter.

Scarpa¹⁹² has described an inguinal hernia which descended in front of an *encysted hydrocele of the spermatic cord*. The hernia was tense, above the middle size, and appeared unusually raised at its lower part by a body situated behind it, which was evidently not the testicle. During the operation, a strangulated portion of intestine was exposed, and, after division of the stricture, replaced within the abdomen. There still, however, remained an elastic tumour full of fluid, which, on being opened, proved to be an encysted hydrocele of the cord.

5. *Diagnosis of oblique inguinal hernia*.—Oblique inguinal hernia is liable to be confounded with other herniæ, and with tumours not of a hernial character which occur in the inguinal and scrotal regions. It is impossible, by the external signs, to distinguish absolutely this variety from hernia of the tunica vaginalis: but fortunately, in a practical point of view, this failure of diagnostic signs is unimportant, since the relations of the protruded parts to their envelopes, and to the epigastric artery, are the same in both; the only difference being, that in one the sac is formed by the tunica vaginalis, and, in the other, by a more recently descended pouch of peritoneum. Although, however, this disease cannot be distinguished with certainty, yet an approach to it may, in most instances, be made by ascertaining the age at which the hernia commenced: hernia of the tunica vaginalis, as before stated, rarely commencing after infancy; oblique inguinal hernia, on the

contrary, seldom being produced prior to the period of adolescence. But during the operation, and when the peritoneal sac or the tunica vaginalis has been opened, the distinction between these two varieties of hernia becomes apparent.

a. Means of distinguishing it from direct inguinal hernia.—The apparently direct course which old oblique inguinal hernia frequently assumes, from the approximation of the abdominal rings, sometimes renders the diagnosis of oblique and direct inguinal hernia extremely difficult. Even when there is a certain degree of tumefaction of the inguinal canal, separated from the scrotal portion of the tumour by a well-marked depression caused by the external ring, we are not justified in deciding that the hernia is oblique; for direct inguinal hernia, when there is great deficiency of the posterior wall of the canal, sometimes produces a slight degree of distension of the canal.* Indeed, we possess no means of deciding, from external examination, whether it be really or only apparently direct; and, consequently, whether the epigastric artery be situated on the iliac or on the pubic side of the neck of the sac. Hence the importance is obvious of the practical rule, laid down by Sir A. Cooper, of dividing the stricture upwards in all cases of inguinal hernia.

During the operation, it may sometimes be conjectured with tolerable accuracy that the hernia is direct, when the cremaster muscle is seen pushed to the iliac side of the hernia; but as this muscle has been known to be spread over a direct hernia, and as it frequently forms an irregular and unequal investment of oblique inguinal hernia, it would be

* M. Bourgery has represented a case of direct inguinal hernia in both sides of the body; one of these slightly distends the inguinal canal, and the interstitial portion of the tumour is separated from the scrotal by an evident depression produced by the external ring, as is so frequently observed in oblique inguinal hernia.—Bourgery, tom. vii. pl. 35.

extremely unwise to deviate from Sir Astley's valuable rule of practice on account of the position of the cremaster.

b. From femoral hernia.—Few points of diagnosis are attended with greater difficulty than the discrimination of femoral from some forms of inguinal hernia. As, however, the comparison of the two affections cannot be well made until femoral hernia has been described, the consideration of this part of the subject will be postponed for the present.

c. From hydrocele of the spermatic cord.—This affection, which consists in an accumulation of serum in one or more cysts resulting from the imperfect adhesion of the tunica vaginalis of the cord, sometimes bears a resemblance to inguinal hernia when the tumour which it forms is situated within the inguinal canal. It is distinguished from hernia by its indolent character, by its unvarying size from pressure or position, and by its exhibiting such a degree of tension as a hernia only possesses under strangulation. If doubt, however, exist respecting the nature of such a tumour from the co-existence of symptoms of intestinal obstruction, it is the safest course to expose it by incision. When the tumour is situated entirely below the external ring, it is known *not* to be a hernia, by the spermatic cord in its normal and isolated state being perceptible above it.

An encysted hydrocele of the cord may sometimes be pushed within the inguinal canal, and thus simulate the replacement of a hernia; but a slight elevation of the integuments in the course of the inguinal canal, or in the site of the internal ring, will shew that the tumour has not actually been pushed into the abdomen.

Hydrocele of the cord sometimes co-exists with hernia, and renders the diagnosis obscure. Scarpa has described a case of strangulated inguinal hernia complicated with hydrocele of the spermatic cord, in which it was necessary to operate.¹⁹⁴ The subject of this case had been affected with a

scrotal hernia on the left side for fifteen years, and, save for a short period after its first occurrence, had not worn a truss. The tumour had acquired a considerable volume, and could not be completely reduced. Soon after the symptoms of strangulation had presented themselves, and, when seen by Scarpa, the hernia somewhat above the usual volume was tense, and appeared raised by a body situated behind it, which could not be the testis, since that organ could be distinctly felt in the scrotum. Signor Cera, who performed the operation, found in the hernial sac a very small quantity of serum, and from three to four inches of the small intestine, which was of a brownish colour. After loosening the neck of the sac and the ring, he reduced the hernia, and exposed a soft and supple tumour, which evidently contained a liquid. On incising it, a certain quantity of serosity escaped; and there was perceived in the bottom of the cyst a vesicular, gelatinous substance, which could be raised with the forceps, and removed in its integrity by a scissor. It became evident, says Scarpa, that the hernia in this case was complicated with an encysted hydrocele of the cord. The patient perfectly recovered in six weeks from both maladies. Mr. Liston has related the following interesting case: "An old gentleman had been for some time affected with a swelling in the course of the cord, which, after careful examination, was discovered to be hydrocele. Symptoms of obstruction of the bowels afterwards occurred, and the swelling became somewhat painful, although but little altered in form or size. The symptoms, however, persisting in a violent degree for more than two days, an incision was made very carefully upon the tumour. The hydrocele of the cord was exposed; but, at the side of it, there was a very small hernial sac containing a portion of intestine."

When the fluid is contained in many cysts, the tumour exhibits an irregularity of surface, and closely resembles an irreducible omental hernia. This variety of the disease Pott

has described as diffuse hydrocele of the spermatic cord, from his supposing the fluid to be diffused through the filamentous tissue which connects the constituents of the cord. Pott must, however, have been in error respecting the seat of this effusion ; for, as the filamentous tissue of the cord is continuous with the subserous tissue of the abdomen, had this tissue been the seat of the fluid, pressure would readily have dispersed it, and obliterated the tumour. In one case, reported by Pott,¹⁹⁵ it is stated, that, on attempting the reduction of the tumour, he “could, indeed, make a small part of it recede ;” but he further says, “the moment I removed my fingers, it fell down again, although the patient was in a supine posture.”

Pott has represented that the omentum, when returned, remains in the abdomen until the patient assumes the erect position, or makes some effort ; while the swelling in diffused hydrocele, although sometimes admitting of being pushed into the abdomen, comes back immediately. In reference to these circumstances Mr. Curling remarks, “I have found, however, that the omentum comes down quickly in some omental herniæ, and that the swelling, when pushed up, does not re-appear immediately in some cases of diffused hydrocele.” Mr. Lawrence mentions the following as diagnostic marks : “The fluctuation of the watery tumour at its lower part ; its imperfect removal under pressure, so that the cord can never be felt in a natural state ; and sometimes a visible enlargement of the inguinal canal and its neighbourhood when the fluid is pushed upwards.” Scarpa has observed that the swelling is firmer and more irregular on the surface in epiplocele, than in the watery swelling. Such tumours resemble irreducible omental hernia in their situation, consistency, and low degree of sensibility. Should the character of the tumour remain doubtful, the presence of fluid may be safely and certainly tested by acupuncture.

Similar serous cysts occur in the female in connexion with

the *round ligament*, from imperfect obliteration of the canal of Nuck;¹⁹⁶ and watery cysts in the inguinal canal may occur in either sex, from the mouth of an old hernial sac becoming closed, and a subsequent accumulation of serum forming in its cavity.¹⁹⁷

d. Hydrocele of the tunica vaginalis.—The tumour formed by common hydrocele is usually more decidedly pyriform in figure than that caused by an inguinal hernia; and the cord may generally be felt above, unconnected with it. When, however, the hydrocele extends upwards into the inguinal canal, it might be mistaken for inguinal hernia, on account of its position in the canal, and from the tumour caused by its presence receiving, like that disease, a slight impulse from coughing. But attention to the following circumstances will render the diagnosis easy: In hydrocele the tumour commences below, and extends upwards, the reverse being the case in hernia;—hydrocele, when large, is usually translucent and fluctuating, but *never tympanitic*; while hernia is very rarely attended with such a degree of serous effusion into the sac as to allow of fluctuation, still more rarely exhibits even a slight degree of translucency, and is *sometimes tympanitic*;—and, lastly, hydrocele is not subject to variations in size from pressure or position; while hernia, on the contrary, frequently recedes or disappears on the assumption of the recumbent posture, as well as under manual pressure.

It should, however, be borne in mind, that translucency is not an unequivocal sign of hydrocele. Arnaud was consulted respecting a large tumour extending from the abdominal ring to the lower part of the scrotum, the upper part of which was separated from the lower by a circular furrow. A surgeon, who had seen the case, affirmed that the lower tumour was a hydrocele, “because the light of a candle passed through it.” It was accordingly proposed to tap the supposed hydrocele, under the supposition that the upper part of the tumour, regarded as hernial, would thereby admit of being more

easily reduced. Arnaud, finding that the patient complained of the same kind of sharp pain on pressure upon the lower as upon the upper part of the tumour, which by all was regarded as a rupture; and considering that the gut, if greatly distended with air, and the skin of the scrotum consequently attenuated by excessive distension, might admit of as much translucency in the tumour as if it contained water; inclined to the opinion that the lower tumour was only a part of the upper one, and objected, therefore, to the puncture being made. The surgeons thus differing in opinion, no operation was performed. In twenty-four hours the patient died, and, on dissection, the diagnosis of Arnaud was found to be correct.¹⁹⁸—Again, a boy was brought to me at the Leeds Infirmary with a tumour of the scrotum of large size, tense, and elastic; the integuments being very thin, from the distension which it occasioned. On examination by the aid of a candle, in the presence of several pupils, it was found to be as translucent as any hydrocele which I had seen. Whilst examining it, I observed that there were two opaque lines intersecting the tumour diagonally; which, by pressure, were to a certain extent made to alter their situation. This circumstance, together with the comparative lightness of the tumour, and slightly tympanitic condition which I detected, excited my suspicion as to the disease being a hydrocele, and justified me in treating it as a hernia. The use of the taxis shewed that the diagnosis was correct, and that the tumour was a hernia greatly distended with flatus; for by pressure the distended bowel was with some little difficulty replaced within the abdomen. The opaque oblique lines indicated, most probably, the point of contact of distinct folds of intestine.

Hydrocele of the *tunica vaginalis*, like that of the *spermatic cord*, occasionally co-exists with oblique inguinal hernia, and may be placed above, in front of, or behind the hernia. In these cases, also, the constituents of the cord are not unfrequently found separated. When the hernia is placed above,

—which is its most frequent position,—the existence of two distinct tumours, one possessing the characters of hernia, the other of hydrocele, is generally evident to the touch, and sometimes to the sight; but cases occur in which the two tumours appear blended together. Sir Astley Cooper has figured an instance of this form of complication. It is, however, rare to find the hernia in front; and, in such a case, the intestine might be wounded in the attempt to puncture the hydrocele. Such a liability being possible, it behoves the surgeon to act with extreme caution, and never venture to puncture a hydrocele complicated with hernia, until he has had indubitable evidence that the swelling which he is about to open contains a watery fluid, as indicated by all the physical characters of such a tumour.

When the hernia descends behind the hydrocele, a remarkable condition of parts is produced, which has on some occasions led to considerable embarrassment during the operation for strangulated hernia. The surgeon, not aware of the existence of the hydrocele, opens, as he imagines, the hernial sac, in which he unexpectedly finds the testicle, and the hernia not exposed; instead of which, a tumour presents itself covered by the posterior layer of the *tunica vaginalis*. It will now be necessary for him to proceed with the dissection, and open the double layer of serous membrane which conceals the intestine or omentum. This complication of hernia with a hydrocele in front of it, bears a close resemblance to, if it be not identical with, the affection which has by many authors been described as encysted hernia of the *tunica vaginalis*.

Hydrocele communicating with the abdomen.—A collection of serum in the *tunica vaginalis*, either of the *cord*, or of the *testis*, sometimes exists, and produces a tumour in the inguinal canal or scrotum, which may be gradually dispersed by pressure, in consequence of the communication with the abdomen remaining unclosed. Such tumours have the indolent

character, translucency, and fluctuation of hydrocele: the exit of the fluid is often attended with a peculiar vibratory thrill; and, after the serous bag has been emptied by pressure, the tumour slowly returns.

e. Varicocele.—This disease sometimes bears considerable resemblance to a reducible epiplocele which has descended below the external ring. A female lately applied to my colleague, Mr. Hey, at the Leeds Infirmary, for a truss, bringing with her a certificate from a surgeon that she had inguinal hernia. At first sight the tumour bore a considerable resemblance to this disease, but, on examination, it was found to be a large *varix of the labium*.¹⁹⁹ Varicocele has an uneven surface; it disappears in the recumbent position, and is reproduced when the erect posture is resumed. It also becomes enlarged during the act of coughing, and on other muscular efforts. The disappearance and reproduction, however, are more gradual and uniform than the similar changes in the reduction or descent of a hernia; not being effected abruptly in a mass, nor in several successive masses, as in the latter disease. The characteristic form and course of the thickened veins, moreover, can in most cases be detected. It is generally stated in surgical writings, that pressure directed over the external ring will prevent the descent of a hernia, but, by obstructing the spermatic veins, will favour the re-appearance of varicocele, even when the patient is in a recumbent position. Such an opinion must have been advanced on theoretical grounds alone; since, by moderately compressing the spermatic veins at the external ring in cases of varicocele, the dilated veins gradually diminish, in consequence of being relieved from the pressure of the column of blood. Mr. Key, being aware of this fact, has treated varicocele by compressing the spermatic veins by a truss, and several other surgeons have done so by similar contrivances.* Another diagnostic is, that varicocele

* This subject is fully discussed by Mr. Curling in his excellent treatise on Diseases of the Testicle.

most frequently occurs on the left side, while hernia occurs most frequently on the right.

f. Chronic abscess descending through the inguinal canal.—Purulent matter has been known to descend through the inguinal canal, and to form a tumour projecting through the external ring, receding on pressure, or when the patient is recumbent; re-appearing in the erect position, and receiving an impulse from coughing.²⁰⁰ A careful examination of the local characters and general history of such tumours is requisite to determine their nature.

g. Adipose tumour.—The filamentous tissue of the cord usually contains more or less adipose substance, which, in some instances, is so largely developed as to constitute a tumour of considerable magnitude, occupying the inguinal canal, and even projecting through the external ring.²⁰¹ Mr. Lawrence²⁰² has observed, that “these accumulations of fat have the soft feel and lobulated character of ordinary fatty tumours, and produce no inconvenience,—indeed, no symptoms but swelling.”—If, however, symptoms resembling those of strangulation should occur in an individual having a tumour in the inguinal canal supposed to be adipose, all doubt respecting its nature should be removed by exposing the tumour by incision.

h. Inflamed lymphatic gland.—An enlarged gland in the inguinal region, if accompanied by the ordinary symptoms of strangulation, might be mistaken for strangulated hernia; and a strangulated hernia has on many occasions been opened under the supposition that it was an enlarged gland. A judicious inquiry into the local characters and previous history of these affections will generally lead to a correct diagnosis. Should any doubt remain, it is the safer course cautiously to expose the tumour by successive incisions of its investing structures.

i. A testicle retained within the inguinal canal, from its imperfect descent, will cause a tumour simulating inguinal

hernia as to situation, and occasionally in admitting of being pushed back into the abdomen. Its nature, however, may be known by the absence of the *testis* from the scrotum, and by the sensation characteristic of compression of that organ being produced on pressure. Occasionally hernia is complicated with incomplete descent of the *testis*. In this case, the absence of the testicle from the scrotum, and the peculiar sensation produced by pressure, indicate the situation of the testicle; whilst the replacement of a distinct portion of the tumour within the abdomen, often with gurgling, or the symptoms of strangulation, indicate the co-existent hernia.

*k. Hematocele of the tunica vaginalis (αἷμα, blood).—*Mr. Morton has related a case of hematocele which had been sent into the hospital for the purpose of undergoing the operation for strangulated hernia. The subject was an elderly person, who had long suffered from hydrocele. After receiving a violent blow, he was suddenly seized with pain and tension of the part, accompanied by urgent sickness, vomiting, and constipation of the bowels. After a strict investigation into the history of the case, the correct conclusion was drawn that it was not a hernia, but hematocele supervening upon an old hydrocele.²⁰³

CHAPTER III.

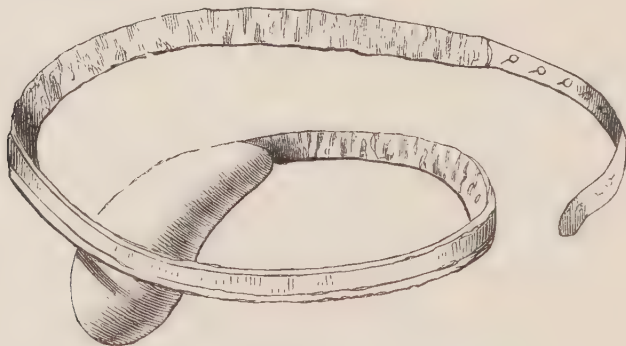
TREATMENT OF OBLIQUE INGUINAL HERNIA.

Reducible oblique inguinal hernia.

1. *Palliative treatment. Trusses.* — The palliative treatment of oblique inguinal hernia, in the reducible state, has for its object the retention of the viscera within the abdomen by means of bandages or trusses.

The pressure exercised by these instruments should be directed over the whole extent of the inguinal canal, more especially its abdominal extremity. Various mechanical contrivances have been devised for accomplishing this object, the most efficient of which are the trusses most commonly in use, namely, the Common truss, Chase's truss, and Salmon's truss.

Fig. 31.

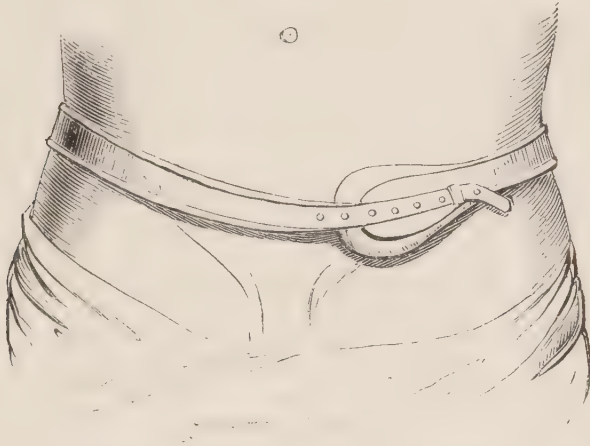


Single Common Truss.

The *single common truss* (figs. 31 and 32) for oblique inguinal hernia consists of a pad adapted to the size and form of the inguinal canal and rings, and a spring which closely em-

braces the affected side of the body. It presents many modifications in the size and form of the pad, in the length of the spring, and in the various accessory parts.

Fig. 32.



Single Common Truss applied.

The pad, in ordinary cases, should be of an oval or oblong form, of a moderate and uniform degree of convexity, and of size sufficient to allow it to extend two or three lines beyond the boundaries of the inguinal canal. It may be constructed of a flat plate of metal, having attached to it a nucleus of cork covered with five or six layers of flannel, and an external envelope of leather. Or, the pad may be formed of a solid mass of caoutchouc, or of a nucleus of cork covered with a layer of caoutchouc. When the latter material is employed, a thin compress of linen should be interposed between the pad and the skin, to prevent its adhesion to the skin.

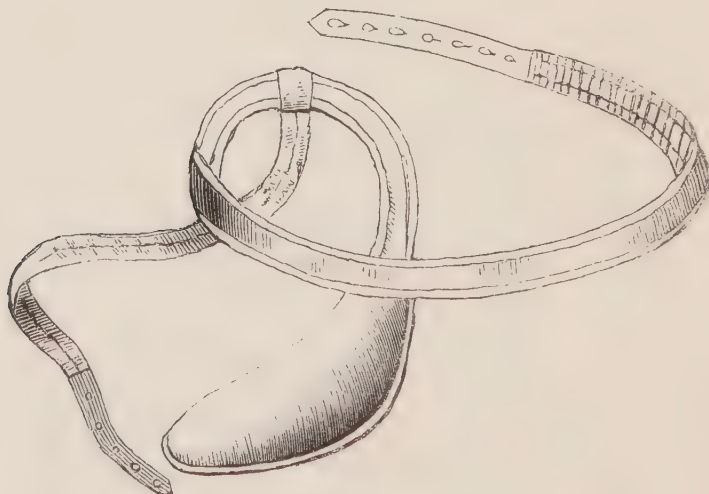
In young subjects, whose muscles are powerful, the pad should be of smaller size, and of greater convexity; for in them a more concentrated pressure is required. In old persons, whose muscles and aponeuroses are feeble, the pad should be larger and flatter. In those whose external oblique muscle acts so powerfully as to displace the ordinary pad, M. Malgaigne substitutes one of an egg-shape, of

which the greater convexity is directed over the internal ring. In some rare cases, where the hernia was difficult of retention, —apparently from the great developement of the internal oblique muscle, causing its inferior border during contraction to form a thick edge, whereby the pad was elevated, and the internal ring left unprotected,—M. Malgaigne²⁰⁴ employed a pad, the convexity of which was greatest along its inferior border, more especially at its iliac extremity.

When the hernia has considerably dilated the canal, a pad of greater breadth and less convexity is required. The ovoid form, with the greatest convexity corresponding to the internal ring, may also with advantage be employed.

When the posterior wall of the canal has been so much encroached upon, in consequence of the large size and long continuance of the protrusion, that the hernia is apparently direct, the ordinary pad is quite inefficient. In this case a pad is required which shall effectually close the external ring as well as the internal, which now nearly correspond in situation with each other. The form of pad which generally

Fig. 33.



Spring Truss with Triangular Pad.

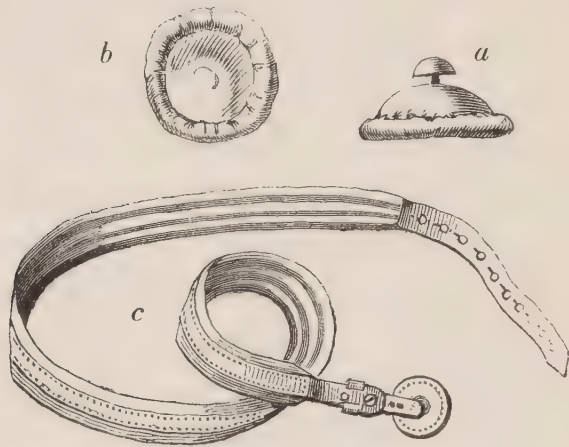
answers this purpose is the triangular (fig. 33), the inferior angle being most acute, and corresponding to the upper

surface of the pubes, whilst the inferior border of the pad accurately corresponds with the fold of the groin. This pad should be well stuffed, having its greatest convexity along its superior border; so that, whilst its inferior angle rests gently upon the pubes, the superior border may make a more decided pressure upon the muscular wall. This form of truss has been extensively used by M. Malgaigne at the Bureau Central, and repeated trials of it have enabled me to bear ample testimony to its utility. The principal object to be attained by this pad is the accurate closure of the external ring; but, in those subjects who have a very prominent spine of the pubes, its pressure can scarcely be borne. In such cases, the pad of caoutchouc, filled with air, is found to be temporarily efficient, but it is subject to the inconvenience of becoming in a few months flaccid, from the gradual escape of the air; an inconvenience which has been remedied by the ingenious but somewhat expensive apparatus of M. Cresson, whereby the air can be replenished from time to time by means of a syringe adapted to the pad:²⁰⁵ or a pad of caoutchouc, stuffed with curled hair, may form a useful substitute.

In a case of unusual difficulty, which could not be relieved by the triangular pad, nor by various other devices suggested by the most celebrated truss-makers of Paris, M. Malgaigne succeeded in the following manner (fig. 34):—He procured a piece of wood turned to the form of a mushroom, with a head adapted to the size of the external ring, supported on a stem somewhat narrower. This was mounted on a metallic plate, which was moderately padded near the wooden projection. Having placed this pad upon the aperture, he retained it in position by a common spring-truss of very moderate power which happened to be at hand. The hernia was perfectly retained.²⁰⁶ This apparatus is of great value in the retention of inguinal hernia, whether really or apparently direct, and in umbilical hernia. I obtained a similar instrument from M. Charrière, the solid central part of

which was formed of ivory; the external surface of the metallic plate being concave, so as to allow a convex metallic disc, connected to a spring by a ball-and-socket joint, to rest upon it. I have also had the same apparatus executed for me with great skill by Mr. Thomas Eagland of Leeds.

Fig. 34.*



M. Malgaigne's Truss with Mushroom Pad.

It is of great importance in all these trusses that the spring should be attached to the pad in such a manner that it may act perpendicularly upon that part of the pad where its pressure can be most advantageously exercised. This point is the most central part in all circular, oval, or triangular pads which have a tolerably uniform degree of convexity. But in those which have the convexity greatest towards one extremity or one of the borders, the point of pressure should correspond more nearly with the more convex part. Such trusses as have the spring attached along the upper border of the pad are generally defective, from the pressure being inefficiently and unequally exerted. It is of importance, particularly in subjects who are loaded with fat, to allow considerable space to intervene between the spring and the internal surface of the pad, that the action of the spring may not be interrupted by the imbedding

* *a.* Detached pad seen in profile. *b.* Convex surface of the pad. *c.* Spring truss with convex disc

of the pad in the fat. This object may be attained either by increasing the thickness of the pad, or by employing an intermediate stem.

The length of the spring adopted by many surgeons is such as to allow it to embrace a little more than half the circumference of the body; but those trusses which have the spring sufficiently long to extend two or three inches beyond the haunch of the unaffected side are to be preferred.

To secure comfort to the wearer as well as efficiency in the action of the truss, the utmost attention must be paid to the form of the spring, which should accurately adapt itself to the obliquity of the posterior surface of the pelvis, the reverse obliquity of the lower part of the abdomen, and the vertical outline of the haunches. If a straight slip or ribband of steel be bent so as to encircle the body like the spring of a truss, it is evident that it would only rest upon the back of the pelvis by its inferior edge, instead of having the whole of its inner surface in apposition with the skin. It is also necessary that the anterior extremity of the spring should exert its influence in a direction obliquely upwards and backwards, corresponding to the outline of the lower part of the abdomen. Such an effect cannot be adequately attained by the twisting upwards of the anterior extremity of a cylindrical hoop of metal. The requisite form of the spring may, however, be attained by making the steel assume two reversed curves, as

Fig. 35.

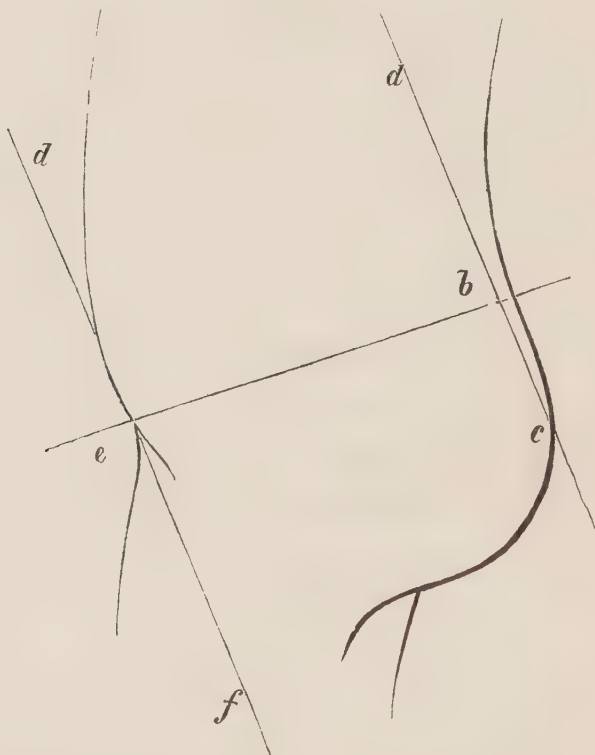


Form of Spring for Single Inguinal Truss.

in the accompanying diagram (fig. 35). One of these curves (*a* to *b*), which involves the portion of the spring applied to

the posterior surface of the pelvis, has its convexity directed downwards; the other, which involves the anterior extremity of the spring, is the reverse. If the portion of the spring *a* to *b* be bent in the horizontal plane, it will form a portion of a cone, the upper border being shorter than the inferior, and its anterior surface directed downwards and forwards, corresponding accurately with the oblique outline of the back of the pelvis. By curving the anterior extremity in the horizontal plane, its inner surface is made to assume an obliquity corresponding with that of the lower part of the abdomen; whilst the portion of the spring situated intermediately between the two curves has a vertical direction, its inner surface corresponding with the outline of the haunches (fig. 36). This

Fig. 36.



parallel obliquity between the anterior and posterior portions of the spring enables them to exert their pressure in the same line.*

* Some excellent trusses constructed upon this principle have been made for me by Mr. T. Eagland of Leeds.

The spring must be lined with wadding on its inner surface, and enveloped in leather or silk.

When the spring is constructed of the length we have recommended, so as to extend two or three inches beyond the haunch of the unaffected side, it is capable of maintaining its proper position on the body under ordinary exertions without the aid of a connecting strap; yet such an appendage should nevertheless generally be attached to the spring, as a protection under violent efforts. As the connecting strap should only be used with this object in view, it is unnecessary for it to be tightly attached to the pad.

If the truss be well constructed and the figure of the patient natural, it ought to retain its proper position with but little tendency to displacement. In those subjects, however, who have a prominent pubes and a very flat abdomen, the pad has a tendency to rise upwards. This inconvenience may be remedied by the use of a perineal strap, which should be attached posteriorly to the spring, and anteriorly to a button on the pad.

The *measure* for this truss is taken by passing a string horizontally round the body at the part where the viscera protrude. The mechanist, in constructing the truss, allows one inch of additional length to compensate for the wadding.

The *application of the truss* is effected in the following manner:—The truss being placed lightly round the pelvis, the patient is directed to lie down. The surgeon then carefully replaces the viscera, and determines with accuracy the situation of the aperture through which they had escaped. Retaining the viscera within the abdomen by one or more fingers, he brings the pad over the aperture, and substitutes it for the fingers; he then adjusts the girdle of the truss horizontally round the pelvis, and fixes the strap to the plate of the pad.

The efficiency of the truss may be tested by placing the patient in the sitting posture, the legs being widely separated, with his body bent forwards, and, while in this position, di-

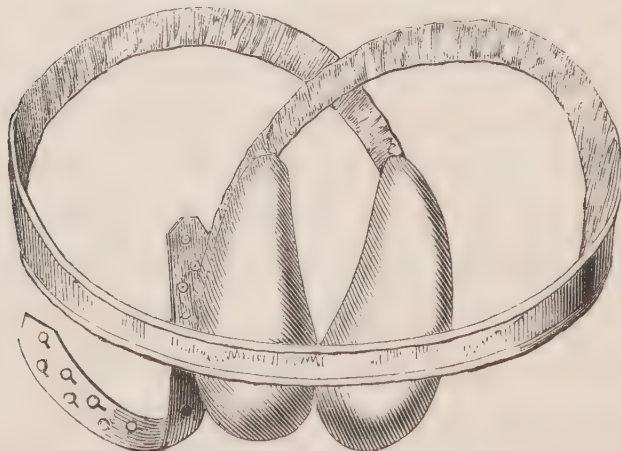
recting him to cough. Or, if he be a person whose muscular system is greatly developed, or whose occupation requires powerful exertion, he may stand with the legs widely separated, and, whilst lifting a heavy weight at arm's length from the ground, be directed to cough suddenly and forcibly. If the truss resist the protrusion during the latter effort, it may be pronounced, for the time, efficient; but it must be remembered, that, after being used a few days, the pad may possibly have become so altered in form by the pressure, or the adipose tissue may have become so absorbed, that the instrument is no longer capable of retaining the viscera. Hence it is important to delay pronouncing an opinion upon the permanent value of the truss until it has been some time in use, and until its retentive power is not only ascertained to be sufficient, but also that it can be worn without producing painful or injurious pressure.

When expense is not an object, it is desirable that the patient should possess two trusses.

It is often useful to interpose between the pad and the skin three or four folds of soft linen, which may be changed daily. The skin is to a certain degree protected thereby from injurious pressure, and the pad preserved from the effects of the perspiration.

The *double common truss* (figs. 37, 38) for oblique inguinal

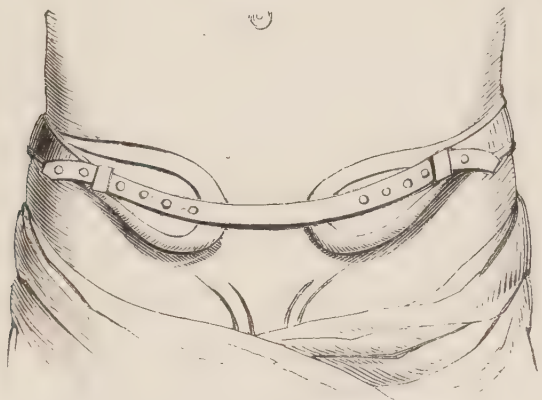
Fig. 37.



Double Common Truss for Oblique Inguinal Hernia.

hernia is formed of one spring, having a pad attached to each extremity. The metal for the spring should be cut in the form of a triple curve, the central curve corresponding to the

Fig. 38.



The Double Common Truss applied.

back of the pelvis, having its convexity downwards, whilst each extremity is curved in the reverse direction (fig. 39). The two pads are united by a connecting strap.

Fig. 39.



Double Spring for Double Truss.

In taking the measure for a double truss, it is necessary not only to observe the circumference of the pelvis, but also to mark the distance between the two internal rings.

In applying this truss, the patient is desired to retain the first pad in position whilst the surgeon adjusts the second, and connects the two by means of the strap.

The efficiency of the apparatus may be tested in the manner recommended in reference to the single truss.

Chase's truss for oblique inguinal hernia may be regarded as a modification of the common truss, its chief peculiarity

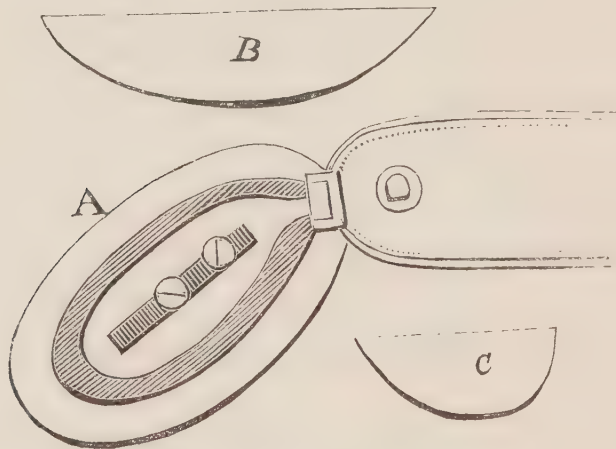
being the hard pad of wood or ivory, accurately adapted to the size and form of the hernial aperture, with which it is furnished.

I am unable to speak of the merits of the truss from my own observation; but I am induced to give a detailed description of the instrument, from the high terms of commendation in which it is noticed by the Philadelphian committee.²⁰⁷ Its retentive power is said to be perfect, and the comfort experienced by the patients in wearing the instrument so great, that they generally relinquish its use unwillingly, and sometimes absolutely refuse to do so when pronounced cured by the surgeon.

The following is a description of the *single* truss :

(Fig. 40.) The pad or *block*, as it is termed by Dr. Chase,

Fig. 40.*



Chase's Truss for Oblique Inguinal Hernia.

is constructed of wood, surmounted by a thin oval plate of brass (the *block-rider*), which is adapted to the under surface of an iron plate of nearly similar form (the *block-slide*), and is attached to it by two round-headed screws, which, when slightly loosened, play freely on a longitudinal opening in the

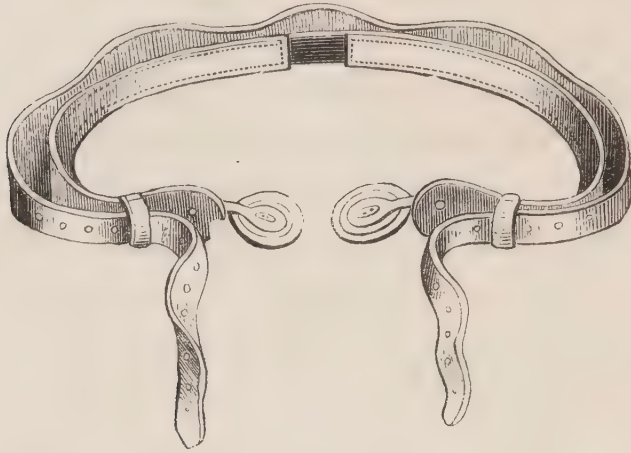
* *a.* The pad or block. *b.* Longitudinal section of the block. *c.* Transverse section of the block.

block-slide, so as to admit of change in the position of the block in this direction to the extent of an inch. The block-slide is connected to the spring by means of a round neck of soft iron, about three-quarters of an inch in length, sufficiently stiff to resist any change of form during the most active movements of the patient, and sufficiently pliable to act like a universal joint in the hands of the surgeon. The spiral form of spring is adopted, and the girdle is completed by a strap attached to the posterior extremity of the spring, and fastening to a button at the anterior extremity above the pad. An elastic temper is given to all that portion of the spring which intervenes between the pad-attachment in front and the opposite sacro-iliac symphysis behind; but the portion extending from the latter point to the opposite side of the pelvis should be so far softened as to admit of adjustment by being permanently bent. Three inches of the hinder extremity are left ductile in all the trusses of full size; and thus the necessity of making an instrument expressly for each individual case is obviated, "without sacrificing the accuracy of the adjustment on the one hand, or its permanency on the other." Three distinct curves are given to the spring: one, by which its anterior extremity descends to the pad; a second, by which the anterior extremity is made to face obliquely upwards towards the abdomen; the third, by which the posterior portion of the truss is made to face obliquely downwards, so as to adapt it to the obliquity of the sacrum. By the strap-button being attached to the anterior extremity of the spring instead of to the pad, the disposition of the instrument to tilt or ride upwards is reduced almost to nothing. The perineal strap is never wanting in Dr. Chase's inguinal truss. A back-pad is attached to the spring by a sliding loop of leather.

The *double truss* of Dr. Chase consists of two single trusses so combined as not to interfere with each other's action. The committee, to whom was referred the testing of this truss, in

their report state, that they cannot report too highly of this beautiful invention.*

Fig. 41.



Chase's Double Truss for Oblique Inguinal Hernia.

Salmon's single truss (fig. 42) for oblique inguinal hernia consists of a circular spring, with a pad attached to each of its

Fig. 42.

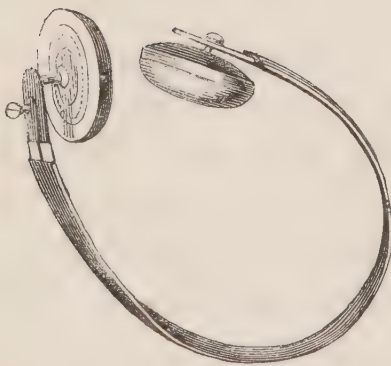
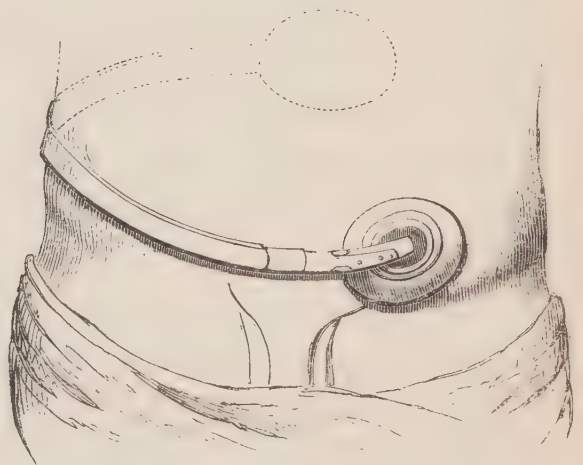


Fig. 43.



Front view.

extremities. The spring embraces, without being in contact with, the sound side of the body, extending anteriorly over the pubes so as to reach the affected side. The anterior pad

* Committee of Philadelphia Medical Society. Third Report, see p. 134.

is oval, and is connected with the spring by a ball-and-socket joint. The posterior pad is circular, and is attached to the spring by a screw with a narrow neck, which allows the spring to play freely upon it. By this arrangement the pads retain a fixed position,—the oval one over the hernial aperture, the circular on the back part of the pelvis; considerable freedom of motion being allowed by the spring.*

This kind of truss is generally worn with great comfort to the patient, and sometimes succeeds in retaining the hernia when the common truss has failed.

Fig. 44.



Back view of Salmon and Ody's applied.

Salmon's double truss consists of two separate springs, each of which embraces the affected side, and is attached posteriorly to one common back-pad.

2. *Radical cure of reducible oblique inguinal hernia.*—The great anatomical changes to be aimed at in the treatment for the permanent cure of hernia are, the contraction of those openings in the muscular and aponeurotic structures of the abdominal walls which have been described as the hernial apertures; and, for the purpose of accomplishing this object, the perfect retention of the hernia within the abdomen for a

* These instruments are prepared by Mr. Ody, one of the original patentees, at No. 292, Strand, London.

considerable length of time is necessary. As the truss is our most valuable aid for effecting these objects, the importance of directing our best exertions towards the perfect adaptation of it to each particular case will at once be apparent.

By the use of trusses oblique inguinal hernia is occasionally cured; in young and robust subjects not unfrequently, but in old and feeble persons such a result rarely, if ever, takes place. Moreover, in all cases in which these instruments are used for the purpose of promoting a radical cure, the surgeon feels that he is not only adopting the most effective treatment for the attainment of this great object; but also that he is, at the same time, using the best palliative measure for the disease, even when, as in old persons, there is scarcely a remote probability of the radical cure being effected. Under extreme circumstances, where the evils resulting from the disease are great, and trusses are found to be unequal even to their palliation, the surgeon may be justified in resorting to some of those operative proceedings which have been devised for promoting the radical cure. Of those operations, the proceeding of M. Gerdy demands a preference. In some cases it is capable of effecting a radical cure, and in others it may produce such a degree of contraction in the aperture as to render the truss of use as a palliative measure. It must, however, be remembered that this operation is not altogether devoid of danger, and that it ought not to be performed unless the circumstances demanding it be urgent.

Treatment of oblique inguinal hernia when irreducible.

If, in any case, it is impracticable to convert the irreducible into the reducible condition, the further increase of the hernia must be prevented, and the inconveniences resulting from it palliated by the use of the truss with a hollow pad when the hernia is of small size, or by the suspensory bandage made to lace in front when the tumour has attained a great magnitude.

Treatment of oblique inguinal hernia when strangulated.

The employment of the taxis in conjunction with its various adjuvants (see p. 94, *et seq.*) having proved ineffectual in reducing the hernia, or the circumstances of the case forbidding the use of the taxis, the surgeon must resort to the knife for the relief of the disease.

Before commencing the operation, he must decide whether it is proper to attempt the division of the stricture without opening the sac (see p. 108), or it would be more prudent to expose the protruded viscera. His decision on this point will to a certain degree modify his proceedings.

α. Operation without opening the sac, the hernia being interstitial.—An incision, two inches in length, may be made over the tumour in the direction of the inguinal canal, through the skin and superficial fascia, whereby the aponeurosis of the external oblique is exposed. A small perforation is next made through this tendinous expansion a little above the external ring, and the opening enlarged obliquely upwards in the direction of the fibres to the extent of about one inch. The spermatic sheath, over which a few fibres of the cremaster are spread, is thus exposed. A flat director may now be cautiously introduced behind the inferior edge of the internal oblique and transversalis; and, if these structures appear to exert a constricting influence upon the hernia, a few of their lower fibres may be divided by the hernia knife. The parts being thus released from stricture, the contents of the sac must by gentle pressure be replaced within the abdomen.

β. Operation involving the opening of the sac, the hernia interstitial.—If in the former proceeding it is ascertained that the parts external to the sac are not the seat of stricture, or from the condition of the patient it is deemed necessary to expose the protruded viscera, the surgeon proceeds with the section of the envelopes, dividing in succession the sheath of the spermatic vessels, the subserous tissue, and the sac; he

then passes his finger to the upper part of the sac, and insinuating the tip of the finger within the stricture, or passing the director behind the constricting band into the abdomen, releases the stricture by a slight touch of the hernia knife directed upwards or parallel to the median plane. The protruded parts are then examined, and treated as directed at p. 126.

γ. *Operation without opening the sac, the hernia scrotal.*—An incision, two inches in length, may be made over the lower part of the inguinal canal and external ring. The skin and superficial fascia being divided, and the aponeurosis of the external oblique exposed, an opening about one inch in length is made in the latter a little above the external ring. The next step is to ascertain if the stricture be seated either at the external or the internal ring. For this purpose, the flat director is passed downwards through the opening in the external oblique beneath the external ring, and, if the fibrous boundary of this opening is found tightly embracing the protrusion, it must be divided; if, on the contrary, the director passes freely beneath it, and by pressure on the scrotal portion of the tumour its contents can be readily pushed upwards through the external ring so as to distend the parts within the inguinal canal (Key), it is evident that the external ring is not the seat of stricture. The director must then be passed upwards behind the lower edge of the internal oblique and transversalis; and, if it is found that these structures constrict the hernia, they must be divided to a moderate extent. Afterwards, the protruded intestine must, by gentle pressure, be emptied of its contents, and, along with any omentum that may be protruded, be replaced within the abdomen, unless their return be impracticable from adhesions or other causes of irreducibility; in which case the surgeon must rest satisfied with relieving the parts from stricture and allow them to remain protruded. The wound is to be closed by suture, compress, and bandage. If, however, it is ascer-

tained that neither the external nor the internal ring are the seat of stricture, the external wound must be enlarged downwards, and the operation completed by opening the sac.

δ. *Operation involving the opening of the sac, the hernia being scrotal.*—An incision, three inches in length, commencing a little above the external ring, and extending downwards over the most prominent part of the tumour, must be made through the skin and superficial fascia, so as to expose the external ring and the spermatic fascia. A small opening having been made in the latter, it must be further divided upon a director, as high as the external ring. The cremaster being next divided to the same extent, the surgeon examines carefully by the sight and touch, before opening the spermatic sheath, which is now exposed, whether any of the constituents of the spermatic cord pass in front of the tumour; and, finding that this is not the case, he divides the spermatic sheath upon a director, being cautious how he extends the incision downwards, remembering that in some large herniæ the elements of the cord pass forwards in front of the lower part of the tumour (see fig. 29, p. 243): the subserous tissue, of very variable thickness, is next divided, and the sac is exposed. The surgeon now endeavours to pinch up a small fold of the sac, detaching it from the contained structures, or, having raised it with the forceps, he cautiously perforates the serous bag by the scalpel held horizontally, and afterwards enlarges the opening on a director. The stricture is next divided *directly upwards*, and the protruded parts being examined are treated in the manner already described.

CHAPTER IV.

HERNIA OF THE TUNICA VAGINALIS.

Synonym. HERNIA CONGENITA (HALLER).

THE protruded parts, in this variety of inguinal hernia, are lodged in males in the tunica vaginalis, and in females in that pouch of peritoneum which sometimes extends through the inguinal canal, in connexion with the round ligament, named the canal of Nuck.

Before describing hernia of the tunica vaginalis, it may be desirable to call to mind some of the leading facts connected with the descent of the testicle.

The testicle, through the agency of the gubernaculum or fetal cremaster, descends during the latter half of fetal life from its original position within the abdomen, through the inguinal canal, into the scrotum. In effecting this descent, the gubernaculum not only draws down the testicle, but also a portion of the neighbouring peritoneum, which forms a serous bag for the reception of the testicle, and partially precedes it in its descent through the inguinal canal into the scrotum. The testicle having reached the scrotum, usually before the period of birth, the elongated neck of the serous pouch soon diminishes in capacity, and ultimately becomes closed to an extent nearly corresponding with that of the spermatic cord; whilst the testicle remains doubly invested by its own serous membrane.

It has already been shewn (p. 224) that the periods of this descent of the testis and the closure of the vaginal canal are subject to occasional irregularity. Thus, the testicle may not

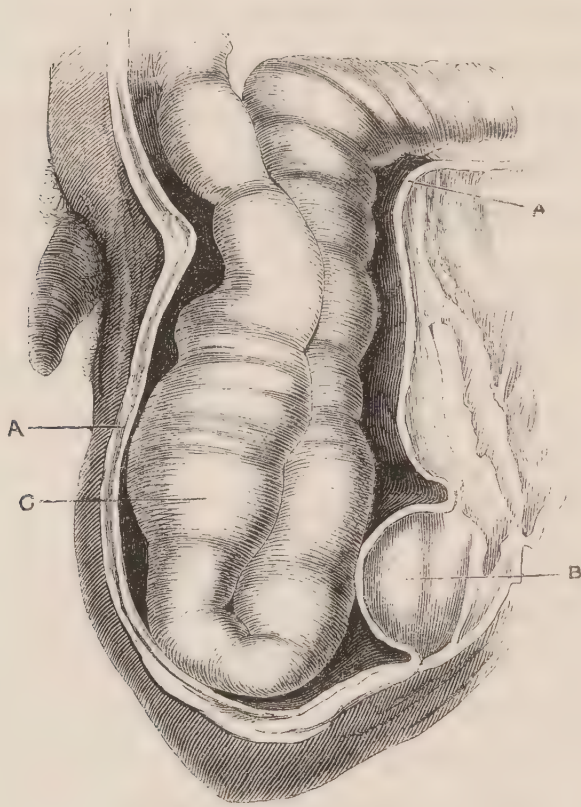
reach the scrotum until some days, or weeks, or even years, after birth; and cases have been recorded in which its descent has been delayed to the period of puberty. It may even be permanently arrested within the abdomen or inguinal canal from one or more of the following causes:—adhesions formed within the abdomen; small size of the external ring; and, occasionally, from imperfect development or paralysis of the cremaster muscle. It is also important to be remembered that the closure of the elongated neck of the serous pouch or vaginal process of peritoneum may be delayed or altogether prevented; or it may be closed partially and irregularly at one or more points, leaving serous cysts in connexion with the cord, or one serous pouch extending more or less completely through the inguinal canal, open towards the abdomen, but not communicating at its other extremity with the cavity of the tunica vaginalis of the testicle.

These defects in the natural processes produce some important modifications of the variety of inguinal hernia which we are now considering.

1. *Hernia of the tunica vaginalis, the descent of the testicle being complete.*—This form of hernia, although called congenital, very rarely, if ever, exists at the time of birth. It usually originates when the child is a few days or weeks old; occasionally in the second or third year, and rarely in adult age. Frequently, while the child is in the act of crying, or in any other state in which the abdominal muscles are called into violent action, some portion of the abdominal viscera may descend at once into the scrotum; and not by successive stages, as is usual with oblique inguinal hernia. The form of the tumour is somewhat similar in these two varieties; but in oblique inguinal hernia the viscera rarely descend, in the largest protrusions, as low as the testicle, which can generally be felt below the hernia, where it may be seen forming a tumour more or less distinct; whereas hernia of the tunica vaginalis usually descends to the lower part of the serous cavity, even a little

below and in front of the testicle, which can only be obscurely perceived at the back part of the tumour (fig. 45).

Fig. 45.*



Hernia of tunica vaginalis.—Guy's Hospital.

Hernia of the tunica vaginalis is covered by the same envelopes as the scrotal form of oblique inguinal hernia, except that the sac is formed by the tunica vaginalis, instead of by a more recently descended pouch of peritoneum. Like oblique inguinal hernia, it descends in front of the spermatic vessels and the testicle, the epigastric artery ascending along the pubic border of the mouth of the sac; the sac, however, is thinner, and, being adherent posteriorly to the spermatic vessels, is more fixed, and the fibres of the cremaster more closely adherent to it than they are to the sac of oblique inguinal hernia.

The unclosed state of the tunica vaginalis at its upper

* A. A. Tunica vaginalis cut open. B. Testis. c. Intestine descending in front of the testis.

part has been assigned as the chief cause of this form of hernia; but, since a mere layer of serous membrane is known to be a very ineffectual barrier against hernial protrusions, some other cause, more efficient, must exist for the production of inguinal hernia in infants. This cause we presume to be the weakened condition of the muscular and aponeurotic portions of the abdominal wall in the inguinal region, from the inguinal canal having been recently dilated by the passage of the testicle. Such a state of local weakness existing at the time of birth, the subsequent exertions of the respiratory muscles in the act of crying protrude the viscera. But although the open state of the vaginal canal may exert but little predisposing influence in reference to inguinal hernia, yet, when the efficient predisposing and exciting causes of the latter affection exist, the patent state of the tunica vaginalis would favour the descent of the viscera into the serous bag rather than into the cellular tissue on its exterior, and thus determine the production of hernia of the tunica vaginalis rather than of oblique inguinal hernia. Thus, a hernia which occurred suddenly from exertion in a patient of Mr. Luke, aged twenty-four, proved to be hernia of the tunica vaginalis.²⁰⁸ Velpeau mentions four or five cases in which the descent occurred at various ages, from eighteen to twenty-one.²⁰⁹ Adhesions contracted within the abdomen between the testicle and the intestine or omentum, if they do not prevent the descent of the testicle, must also be regarded as a cause of this form of hernia; the testicle dragging the viscera down during its descent into the scrotum.

From the long-continued pressure of the hernia upon the cord or upon the testicle itself, the latter organ in adults is generally found atrophied. M. Malgaigne mentions the case of a man, forty years of age, who had been the subject of double hernia of the tunica vaginalis from infancy. Both testicles were extremely atrophied, the voice shrill, the beard imperfectly developed, and the adipose tissue abundant.²¹⁰

This variety of hernia may generally be distinguished from oblique inguinal hernia by the age at which it most frequently occurs; the latter being extremely rare in infancy, the former equally rare after that period:—by the hernia becoming scrotal at its first occurrence:—by the testicle not forming a distinct tumour, nor being distinctly felt below the hernia, but obscurely perceived a little above and behind the lower part of the hernial tumour.

2. *Hernia of the tunica vaginalis, the testicle being in the inguinal canal.*—This form of the disease is sometimes interstitial, and frequently attains a much greater magnitude than oblique inguinal hernia in the interstitial stage. The testicle, in most cases of long standing, is atrophied. If the external ring be not completely closed by the testicle, the hernia may descend into the scrotum, although the testicle remains in the inguinal canal. M. Cloquet observed a case of hernia, in which the tumour, of an elongated form, descended to the middle of the scrotum. For example, while performing an operation for this kind of hernia, on opening the spermatic fascia, a few pale fibres of the cremaster were seen enveloping the sac, which descended two inches and a half below the inguinal canal; and, on dividing the sac, he found it to be the tunica vaginalis, which contained omentum: the testicle, flattened, elongated, and atrophied, being observed lying within the inguinal canal, and so small as not to be externally perceptible to the touch.²¹¹ The epididymis, in an unravelled state, and situated about an inch below the testicle, to which it was connected by several delicate filaments, was adherent to the posterior surface of the sac; and, after descending to the *inferior* part of this body, mounted upwards to terminate in the vas deferens, which pursued its usual course through the inguinal canal into the abdomen. This anatomical decomposition and displacement of the epididymis are not unusual in cases where the testicle is retained within the inguinal canal, and is probably owing to the con-

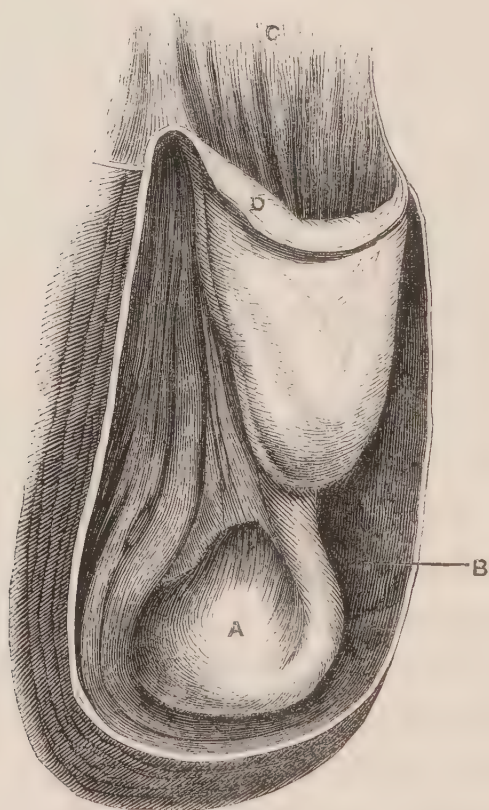
tinued traction of the gubernaculum. Mr. Lawrence has related two similar instances of this condition.

3. *Hernia of the tunica vaginalis, the testicle being within the abdomen.*—The possibility of the occurrence of hernia of the tunica vaginalis whilst the testicle is within the abdomen appears to be established by a remarkable case related by M. Cloquet.²¹² In the body of an old man he found the scrotum empty on the left side, and an elongated rounded body, resembling the cord, situated below the external ring. On opening the abdomen, the left testicle, of its natural size, was found lying between the psoas and iliacus muscles an inch above the entrance of the inguinal canal. The epididymis was situated at the upper and back part of the testicle, its upper extremity firmly adherent to the small intestine; while its lower extremity terminated in the vas deferens, which descended into the pelvis, and in another structure of a fibro-cellular character—the gubernaculum, which, descending beneath the peritoneum, entered the inguinal canal, and terminated in the branch of the ischium and the lower part of the scrotum. On drawing down this structure, the epididymis and a prolongation of the peritoneum, which would have received the testicle had it descended, were put upon the stretch. This prolongation of the peritoneum formed a pyriform serous bag, three inches in length, adhering by its posterior surface to the gubernaculum, and anteriorly to a few fibres from the inferior oblique, which represented the cremaster in an imperfect state. Pott was aware of the existence of this form of hernia; in reference to which he observes, “It sometimes happens that a portion of gut only comes down, the testicle never passing forth from the abdomen, or remaining in the groin, and falling no lower.”²¹³

4. *Hernia of the tunica vaginalis, the tunic being closed at the lower part of the cord, but open above.*—In this modification of hernia of the tunica vaginalis, which by M. Malgaigne has been appropriately named *funicular*, the viscera

enter the unclosed upper part of the tunica vaginalis, but are prevented, by the adhesion or closure below, from entering its permanent portion. Whilst this modification of hernia remains interstitial, it can with difficulty be distinguished from *oblique inguinal* hernia; but its true character may be *suspected*, if the occurrence of the protrusion can be traced to infancy. The disease, however, does not always remain in this condition; for, the causes of protrusion continuing to operate, the funicular pouch becomes elongated, and descends below the *external ring* into the *scrotum*, traversing the filamentous tissue of the cord, and passing in its descent either in *front* of the *testicle* (fig. 46) and *tunica vaginalis* to form

Fig. 46.*



Oblique inguinal hernia behind a hydrocele, described as encysted hernia of the tunica vaginalis.—St. Thomas's Hospital.

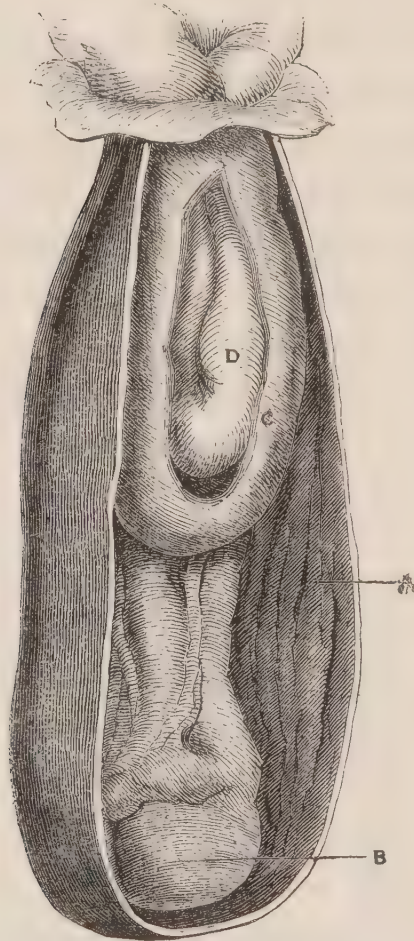
* A. Testis. B. Tunica vaginalis cut open. C. Neck of the sac of an inguinal hernia. D. A double layer of serous membrane, formed by the hernial sac and the tunica vaginalis conjoined.

a scrotal hernia, or behind those parts. The former condition might easily be mistaken during operation, or in dissection after death, for oblique inguinal hernia; but the latter exhibits characters too obvious to be overlooked in such circumstances.

The latter modification of hernia of the tunica vaginalis was first described by Mr. Hey. In dissecting the body of an infant who died of strangulated hernia, he opened the tumour in front, and laid bare, as he imagined, the hernial sac; but which, on opening its inferior portion which was the most prominent, proved to be “the tunica vaginalis, containing, together with the testicle, a portion only of the true hernial sac.” He found that the tunica vaginalis was continued up to the external ring, and inclosed, like a double night-cap upon the head, the hernial sac from the ring to within half an inch of its inferior extremity, and adhering to it by some loose filamentous tissue. The cremaster was evident upon the outside of the *tunica vaginalis*. In a case described by Sir Astley Cooper, the hernia appears to have protruded the blind extremity of the funicular portion of the tube directly towards the tunica vaginalis of the testicle, so as to form a sac-like projection into its interior.²¹⁴ Mr. Hey, supposing this variety of hernia to be peculiar to infancy, named it *hernia infantilis*; but the disease, being since known to have originated even in adult age, has been designated by Sir Astley Cooper *encysted hernia of the tunica vaginalis*. The peculiarities of this affection are strongly marked, and constitute an important modification of hernia of the tunica vaginalis; in which the viscera enter the funicular portion of the tunica vaginalis, but, being prevented by the adhesion below from entering the testicular portion, protrude before them the blind extremity of the serous pouch through the filamentous tissue of the cord, behind the testicle and its serous bag. This explanation of the nature of the disease was first given by the late Mr. Todd of Dublin, and a nearly similar one has since been advanced by Mr. Liston

and M. Malgaigne. Mr. Todd has related some interesting cases in which the disease was complicated with hydrocele ;

Fig. 47.*



Encysted hernia of tunica vaginalis.—Sir Astley Cooper's specimen in the Museum of Guy's Hospital.

the tunica vaginalis, distended with fluid, being placed in front of the hernial sac. It is quite possible that oblique inguinal hernia may, in like manner, after separating the elements of the cord, descend behind the tunica vaginalis and testicle, and present similar appearances or conditions to those which have just been described. Mr. Stanley met with two instances in which the hydrocele was placed directly before scrotal hernia. In both, the component parts of the spermatic cord were separated by the tumour ; and

* A. Tunica vaginalis. B. Testis. C. Hernial sac. D. Intestine.

Mr. Lawrence states that these specimens, with three others in which the hydrocele was placed in front of the hernia,²¹⁵ are contained in the Museum of St. Bartholomew's Hospital.

5. *Hernia of the tunica vaginalis in females*.—Most, if not all, of the inguinal herniæ of females which occur in infancy are situated in the canal of Nuck, a vaginal prolongation of peritoneum extending through the inguinal canal into the labium pudendi, and bearing the same relation to the round ligament as the unclosed tunica vaginalis in the male bears to the spermatic cord. This canal does not exist in all subjects; but is found in many female infants at the time of birth, and, in some instances, remains unclosed through the whole of life. This hernia may be interstitial, being limited to the inguinal canal; or it may protrude beyond the external ring. After escaping, however, from the external ring, it usually descends into the labium pudendi; but it has also, in several instances, been observed to descend into the groin, bearing much external resemblance to femoral hernia. Mr. A. Burns²¹⁶ witnessed six instances of this peculiar form of hernia, and ascertained that the deviation from the usual direction of the tumour was produced by defective developement of the anterior wall of the inguinal canal. In one instance the sac descended into the groin without passing through the external ring. In describing the dissection of one of these cases, Mr. Burns remarks that “the round ligament of the womb was enveloped in a distinct tunica vaginalis; and in this the gut lay, the ligament bearing the same relation to the intestine that the spermatic cord does in the other sex.”

The envelopes of this protrusion in females are the same as in the male, except that there is no cremaster.

Hernia of the tunica vaginalis, in most of its forms, may be irreducible from adhesions contracted between the viscera and the testicle²¹⁷ whilst in the abdomen, or the return of the protruded parts may be prevented by any of those causes which render other herniæ irreducible.

An irreducible portion of omentum sometimes adheres so extensively to the mouth of the sac as to produce its complete closure; and water, subsequently accumulating in the tunica vaginalis below, might give rise to the supposition that it was common hydrocele.²¹⁸ The existence of a tumour in the inguinal region from the period of infancy, which originally, perhaps, was observed to be reducible, would suggest the nature of the affection.

When strangulation occurs in hernia of the tunica vaginalis, the stricture is more frequently produced by the neck or other portion of the sac than in any other variety of inguinal hernia; which results, most probably, from the strong natural tendency of the neck of the tunica vaginalis to close, and from the imperfect performance of that process. The funicular portion of the tunica vaginalis may be contracted without being actually closed in more situations than one; and may thus cause stricture in two or more places. Wrisberg²¹⁹ has noticed two contractions of the hernial sac; one at the lower part of the funicular portion just above the testicle, the other at its abdominal termination. Mr. Lawrence²²⁰ met with two contractions; one halfway between the testicle and the groin, the other at the internal ring.

Treatment of hernia of the tunica vaginalis.

When this hernia is reducible, it may be treated by trusses of the same construction as those employed in oblique inguinal hernia. The common spring-truss, single or double, is more appropriate than Salmon's whilst the child is unable to walk, being less liable to displacement from the pressure of the nurse's arm. A few weeks should elapse from the time of birth before any truss is applied, as the skin is too tender to bear the requisite degree of pressure; which, however, if well directed over the internal ring, need only be very slight. The common pad is liable to be injured by being repeatedly exposed to moisture. To obviate this evil, a pad of ivory may be em-

ployed. For the sake of cleanliness, the trusses of infants should be provided with several envelopes, admitting of easy removal. When the child is able to walk, either the common truss or Salmon's may be employed.

If the testicle should not have descended, the application of the truss may be postponed until the child has attained the age of twelve months, in the hope that by this time the organ may have reached the scrotum. But after the lapse of one year it is not desirable any longer to defer the use of a truss, since the instances of perfect descent of the testicle after this period, although occasional, are rare; and the arrest of the testicle in the inguinal canal, which not unfrequently occurs, is more likely to be attended with atrophy or imperfect developement of the organ than when it is detained within the abdomen.

When hernia exists in conjunction with retention of the testicle within the inguinal canal, a truss with a hollow pad must be employed.

In infancy, a radical cure of hernia of the tunica vaginalis may frequently be obtained by the use of well-adjusted trusses in from six to twelve months.

In the irreducible condition of this variety of hernia, the same treatment must generally be adopted as in oblique inguinal hernia. If the mouth of the sac be closed by adherent omentum, and hydrocele have formed below, the fluid must be simply evacuated by the trochar, or, what is still better, allowed to be absorbed after being extravasated into the filamentous tissue of the scrotum through several minute apertures made by acupuncture. The attempt to produce a radical cure by injection should not be made.

When strangulated, the operation without opening the sac will in most instances be impracticable, as the stricture is so frequently formed by some part of the sac itself. When the operation is performed for the interstitial form of the disease, the structures divided before exposing the viscera are, the

skin, superficial fascia, aponeurosis of external oblique, a few fibres of the cremaster, the spermatic sheath, the subserous tissue, and the tunica vaginalis. The testicle, flattened and atrophied, is generally seen lying on the posterior wall of the canal. The stricture may be divided either upwards or outwards; but, for the sake of maintaining uniformity in all operations for inguinal hernia, it is better to divide the stricture upwards.

When the hernia is scrotal, the parts divided are, the integuments of the scrotum, the spermatic fascia, the cremaster, the spermatic sheath, the subserous tissue, and the tunica vaginalis. The testicle is seen usually at the lower and back part of the sac. The stricture should in this case also be divided upwards.

In that remarkable form of this variety of hernia, named by Mr. Hey "*hernia infantilis*," and by Sir Astley Cooper "*encysted hernia of the tunica vaginalis*," in which the viscera have descended behind the testicle in a sac formed by the prolongation of the funicular portion of the tunica vaginalis, when the testicular bag of this membrane is opened, the testicle only appears, and the viscera are not seen. The posterior wall of the tunica vaginalis of the testicle appears tense and prominent, being distended by the hernia behind it. It becomes necessary, then, to proceed with the dissection, and divide the intervening structures, which consist of the posterior layer of tunica vaginalis, the subserous tissue, and the true sac; after which the viscera are exposed, and are to be liberated by a division of the stricture upwards.

The operation in females differs in no material respect from that which is required for oblique inguinal hernia.

CHAPTER V.

DIRECT INGUINAL HERNIA.

Synonyms. INTERNAL INGUINAL HERNIA. VENTRO-INGUINAL HERNIA.

1. *Situation at which protrusion occurs in this variety.*—Direct inguinal hernia protrudes through the abdominal walls at the pubic side of the internal ring and epigastric artery, either directly or nearly opposite to the external ring. It therefore neither passes through the internal ring, nor traverses the inguinal canal; and it has the epigastric artery of course on its iliac side.

This variety of hernia usually pushes before it the posterior wall of the inguinal canal; and as the structures composing this wall are subject to considerable variety in their development, so the investment which the hernia derives from it exhibits great diversity in its density. Direct inguinal hernia has also been known to pass through a rent in the posterior wall without receiving from it any covering whatever. An interesting case is related by Mr. Key,¹²² in which the hernia had made its way through an opening formed by a separation of the fibres of the transversalis tendon.

The part of the wall which most frequently yields before this form of hernial protrusion is that which is opposite to the external ring: owing to which, the hernia usually protrudes externally in its earliest stage, and gradually descends into the scrotum, forming a more rounded tumour with a broader neck than oblique inguinal hernia.

Cases sometimes occur, in which, from defective development of some of the aponeurotic structures composing the

wall, the weakest portion is situated nearer the epigastric artery, and the protrusion consequently advances into the inguinal canal. Under these circumstances even a hernia on the pubic side of the epigastric artery may remain interstitial, more especially if the external ring be small. An instance of this is recorded by M. Goyrand,²²² in which an epiplocele protruded through an opening six lines in diameter, about the middle of the posterior wall of the inguinal canal, between the epigastric vessels and the umbilical ligament. The aponeurosis of the external oblique was not raised by the protrusion. More frequently, however, the tumour advances through the external ring into the scrotum; but at the same time it may cause a certain degree of tumefaction of the inguinal canal, and may thus closely resemble in its external characters an oblique inguinal hernia. M. Bourgery has figured an inguinal hernia on each side in a man fifty-two years of age. Both herniæ escaped at the pubic side of the epigastric artery; the one on the right partially distended the inguinal canal, whilst that on the left side protruded in a direct course through the external ring.

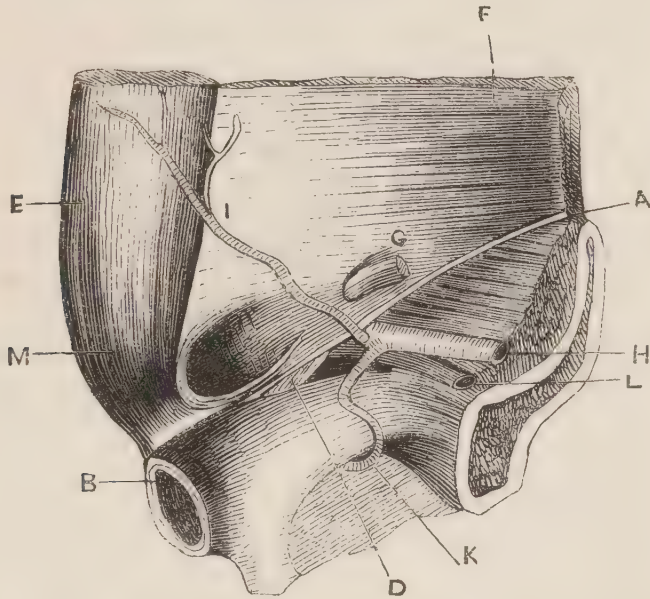
2. *Anatomical peculiarities*.—The most important anatomical peculiarity of direct inguinal hernia, in a practical point of view, is the situation of the epigastric artery. This vessel pursues its course obliquely upwards along the iliac side of the mouth of the sac, at a distance varying from a few lines to an inch and a half from the sac. (Fig. 48.) From the relative position of the mouth of the sac to the epigastric artery, Hesselbach named this hernia *internal*. This author* has recorded an exception to the usual arrangement of these parts, in which the epigastric artery, arising from the obturator, pursued its course along the pubic border of the mouth of the sac.

The spermatic cord is also usually placed on the *iliac* side of the hernia, and a little posterior to it. But deviations

* Disq. Anat. Path. p. 15.

from this position are likewise occasionally observed. Mr. Todd²²³ examined a case in which the spermatic cord extended across the upper part of the sac, and descended along

Fig. 48.*



Direct inguinal hernia, seen from within.—Leeds Infirmary.

its pubic side towards the testicle, which was placed posteriorly. The hernia, in this instance, protruded between the cord and the inferior pillar of the ring. Mr. Lawrence²²⁴ has seen the cord placed behind the sac.

The cremaster muscle, associated with the spermatic cord, is most frequently placed at the iliac side of the hernia, affording to it only a very partial investment, and in many instances not extending at all over its surface.²²⁵ The exceptions, however, to this arrangement are numerous. Mr. Todd,²²⁶ in dissecting the body of a man who had direct hernia on

* A. Anterior superior spinous process of ilium. B. Symphysis of the pubes. C. Poupart's ligament. D. Gimbernat's ligament. E. Rectus muscle. F. Transversalis muscle. G. Spermatic vessels entering the internal ring. H. External iliac artery. I. Epigastric artery ascending at the iliac side of the hernia. K. Obturator artery descending in this case from the epigastric. L. External iliac vein. M. The space occupied by a direct inguinal hernia which has been removed along with its sac.

both sides, found the cremaster entirely on the iliac side of one hernia, which was devoid of any covering from this muscle, whilst on the opposite side "the cremaster muscle was distinctly spread over the fore-part of the sac."

The umbilical artery, being subject to irregularities in its course, passes upwards in some subjects nearer to the pubes than in others, and causes some variety in the source whence the sac of a direct hernia is derived. It has already been stated, that the umbilical ligament separates the peritoneum of the inguinal region into two pouches; one situated on the iliac, the other on the pubic side of that ligament. The iliac pouch furnishes the sac for oblique inguinal hernia, whilst a direct hernia generally derives its sac from the pubic pouch. When, however, the umbilical artery takes its course nearer to the pubes than usual, the sac of a direct hernia may even be derived from the iliac pouch; and, in this case, might have the umbilical ligament on its pubic side. Sir Astley Cooper has related a remarkable case in which there were three direct herniæ on each side of the body; one on each side being on the pubic side of the umbilical ligament, while the remaining two on each side were on its iliac side.²²⁷

3. *The investments of direct inguinal hernia* are the scrotal integuments, the spermatic fascia or fascia of the cord, the cremaster, the posterior wall of the inguinal canal, the subserous tissue, and the peritoneal sac. Several of these coverings are, however, subject to considerable variety. The cremaster, as has been already stated, occasionally gives the hernia a complete investment in front; more frequently a partial covering on its iliac side only, and sometimes no investment at all. The posterior wall of the inguinal canal may vary in density according to the developement of its constituents: in some instances affording a dense covering to the hernia, whilst in others it is spread over the tumour as a membrane of extreme tenuity; and, again, a direct hernia has been known to exist which has been altogether devoid of this

covering, the hernial protrusion having passed through a rent in its texture. The subserous tissue in direct hernia always contains some fat, but the adipose tissue is subject to variation in its quantity and characters in different subjects. The subserous tissue is sometimes dense, and indurated, from interstitial deposit of organisable lymph.

4. *Symptoms and physical characters.*—The tumour in the early stage of this form of hernia is of a rounded form; and, even when it has descended into the scrotum, its neck is relatively larger than in most oblique inguinal herniæ. It rarely, however, attains the magnitude of the latter, or descends so low into the scrotum; and when traced upwards, it passes over the pubes directly upwards and backwards, rather than obliquely towards the ilium, as in the oblique variety; and its base, moreover, is usually situated nearer the root of the penis. The cord, also, may frequently, though not invariably, be felt passing along the iliac side of the hernia.

Although these circumstances may lead to a strong suspicion that the hernia is direct, yet they are not sufficient to enable the surgeon to decide with certainty, before an operation, whether the hernia has protruded on the pubic or on the iliac side of the epigastric artery. Should an operation be considered necessary, the incision of the stricture should be made in an upward direction.

Direct inguinal hernia sometimes occurs in females, in whom it was supposed by Hesselbach²²⁸ to be more frequent than in men; but the general consent of other surgeons favours the opinion that in females this variety of hernia is comparatively rare,—a circumstance readily explained by the small size of the external ring.

Direct hernia in females, on dissection, exhibits no essential difference from the same form of disease in men.²²⁹

The comparative frequency of direct and oblique inguinal hernia, including both sexes, has been estimated by Cloquet as 1 to 5.

The causes which more especially operate in the production of direct inguinal hernia are, large size of the external ring, and defective developement of the lower tendinous portions of the internal oblique and transversalis muscles.

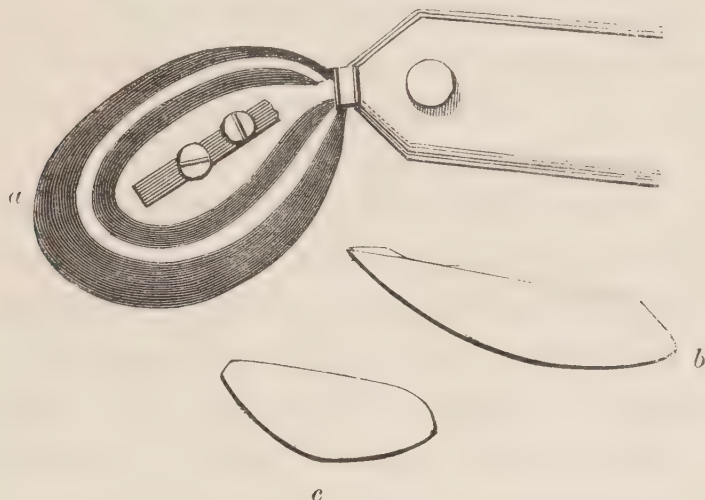
5. *Treatment.*—Direct inguinal herniæ are generally much more difficult of retention by trusses than oblique. The pad of a form calculated to compress the inguinal canal, as recommended in the oblique variety, is ineffectual in direct inguinal hernia. For the relief of this affection the common truss may be employed, with pads constructed in the manner already described for the retention of those more difficult forms of oblique inguinal hernia, which, from approximation of the rings, have become apparently direct. In ordinary cases the triangular pad will be found effectual; in more difficult cases the pad of inflated caoutchouc, or the pad in the form of a mushroom, may be employed. Perhaps the moc-main truss might be used with advantage in this form of hernia. The pad of this truss is stuffed with a peculiar kind of cotton, which has a silky appearance and property; and is covered by a layer of caoutchouc, and over this a layer of washed leather.

The following is a description of Dr. Chase's truss for direct inguinal hernia. "Chase's ventro-inguinal block resembles the common inguinal block, strongly compressed upon its broader convexity, until the more sudden curvature is made to overhang the base to a great extent, particularly in the middle of the length of the block; so that, when the block is placed on its base and viewed perpendicularly, it presents on one margin a semi-elliptical curvature, and on the other an effuse parabola. This form permits the effective pressure of the block to act very near the brim of the pelvis, without injuring the spermatic cord, or contusing the integuments against the bone." ²³⁰

The Philadelphian Committee report of this truss, that "the primary adjustment of the truss is considerably more

difficult, and requires more time and skill in the worst cases of this accident than in the (oblique) inguinal variety; but the ultimate success of retention does not appear to be less perfect when once accomplished."

Fig. 49.*



Dr. Chase's Truss for direct inguinal hernia.

As the surgeon is unable to pronounce with certainty that the hernia is direct, it is his duty, whenever he operates for a strangulated inguinal hernia supposed to be direct, to proceed under the constant apprehension that the hernia may possibly be oblique. If the local and general symptoms are such as to warrant his attempting to relieve the stricture without opening the sac, a small incision should be made over the upper part of the tumour, from above downwards, so as to expose the external ring and the upper part of the fascia of the cord: an opening of small extent being next made into the latter, a flat director (Key's) should be passed upwards under the external ring; and, if it exert any material pressure upon the tumour, a few of its fibres should be divided by the bistoury. If, however, it be found that the stricture is not formed by the external ring, and if the cremaster be found spread over the tumour, it should be turned

* *a.* The pad or block. *b.* Longitudinal section of the block. *c.* Transverse section of the block.

aside by the point of the director, or, if necessary, divided by the knife, in order to ascertain if the next envelope present the smooth, firm, resisting character of an aponeurotic membrane ; and, should this be the case, the membranous covering should be cautiously opened, and a flat director insinuated beneath it towards the abdomen, when any of its fibres which may appear to exert a constricting influence may be divided by the blade of the knife directed upwards. If, on the contrary, after opening the fascia of the cord, and turning aside the fibres of the cremaster, a loose filamentous tissue, more or less loaded with fat, present itself, the operator may presume that this is the subserous tissue pushed before the sac through a rent in the aponeurotic structures. It then becomes necessary to search for the upper edge of this aperture, and, after insinuating the director beneath it, to divide it upwards, and thereby remove the stricture. If, however, it is now found that these parts, external to the sac, have not been the seat of stricture, the operation must be completed by enlarging, if necessary, the external incision, and dividing the subserous tissue and the sac.

Lastly, the director must be introduced within the stricture from the interior of the sac, and the constricting band divided ; the operator always bearing in mind that he must direct his incision in this, as in all other forms of inguinal hernia, *upwards* from the middle of the mouth of the sac : and no presumptuous deviation from this rule, from a confident feeling in his own powers of diagnosis, can be justified under any circumstances.

CHAPTER VI.

FEMORAL HERNIA.

Synonyms. CRURAL HERNIA. MEROCELE.*

Definition.—FEMORAL hernia is a protrusion of the viscera into the sheath of the femoral vessels. Before describing this disease, it is necessary to give a brief anatomical sketch of the parts which it implicates.

1. ANATOMY OF THE REGION OF FEMORAL HERNIA.

The space bounded below and behind by the anterior edge of the os innominatum, and above and in front by Poupart's and Gimbernat's ligaments, is said to be comprised within the *femoral arch*.

The anterior edge of the os innominatum constitutes an irregularly concave line, which extends from the anterior superior spinous process of the ilium—which I shall henceforth designate “the spine of the ilium”—to the symphysis of the pubes. The iliac extremity of this line exhibits a concavity which terminates in an abrupt prominence, the *anterior inferior spinous process* of the ilium. Beneath and to the pubic side of this process is a deep notch, which ends in a slight elevation, situated above the anterior and upper edge of the acetabulum, named the *ilio-pectineal eminence*, from its being the point of junction of the ilium with the pubes. From this point, the horizontal branch of the pubes presents a flat surface of a triangular form, bounded by an anterior and a

* Μηρός the thigh, and κήλη a tumour.

posterior edge, which terminate in an elevated tubercle—the *spine of the pubes*. The anterior edge of this space forms one of the lips of the obturator groove, and gives attachment to the pectineus muscle; the posterior forms part of the superior margin of the pelvis, and is known as the *ilio-pectineal line*. From the spine of the pubes to the symphysis there is a rough horizontal line, of about an inch in extent, named the *crest of the pubes*.

Poupart's ligament has already been described as a fibrous band, formed by the union of the tendon of the external oblique with other aponeurotic structures, and extending from the spine of the ilium to the spine of the pubes. The pubic extremity of this band constitutes the inferior pillar of the external ring, and gives off from its posterior surface a triangular process, named *Gimbernat's ligament*, which constitutes a tense membrane occupying the angle formed by the junction of Poupart's ligament and the pubes. This membrane is about one inch in length, and less than half an inch in breadth, being a little broader in women than in men. Its base forms a crescentic edge, the concavity of which is directed towards the ilium.

The *subcutaneous filamentous tissue* of the upper part of the thigh is continuous in every direction with the general subcutaneous tissue. It lodges the superficial vessels and nerves, which separate it more or less distinctly into two layers: one of which is external, adherent to the skin, of loose texture, and mixed with a variable quantity of adipose tissue; the other, internal, membranous, devoid of fat, adhering rather loosely to the femoral aponeurosis, and more intimately to Poupart's ligament, in consequence of an intermixture of aponeurotic fibres, which are arranged for the most part horizontally below the ligament. The deep layer adheres firmly to the edges of the saphenous opening, over which it is spread; receiving in this situation the name of *cribriform fascia*, from being perforated for the transmission of the superficial veins and lymphatics.

The superficial arteries of this region are the *superficial epigastric*, which ascends over the middle of Poupart's ligament; the *external pubic* branches, two or three in number, which pass obliquely upwards from the saphenous opening over the cord towards the pubes; and the *superficial circumflexa ilii*, which pierces the iliac portion of the femoral aponeurosis, and is distributed to the integuments about the crest of the ilium.

The *great saphena vein*, formed by branches from the dorsum of the foot and the tibial border of the leg, ascends along the thigh, receiving numerous branches in its course; and terminates in the femoral vein, about an inch or an inch and a half below Poupart's ligament. It is lodged in the substance of the subcutaneous tissue, and perforates that part of the deeper layer which constitutes the cribriform fascia.

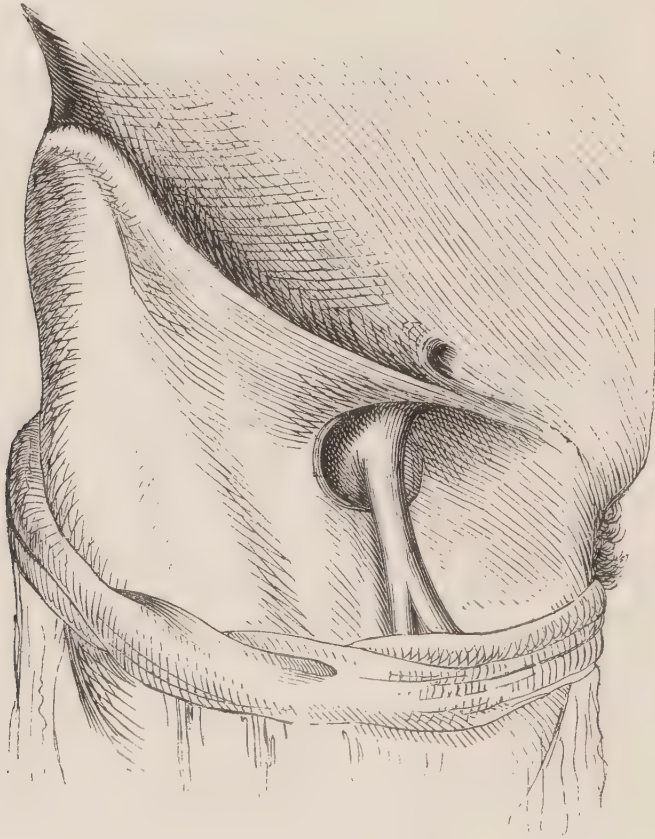
The *lymphatics* from the integuments of the leg and foot accompany the great saphena vein, and enter some small glands placed parallel to it, and in contact with the external surface of the cribriform fascia. Having traversed these glands, they perforate the fascia, and the sheath of the femoral vessels, where they join the deeper-seated lymphatics of the leg and thigh. Within the femoral sheath, some of them frequently traverse a small gland. They afterwards enter the abdomen, and pursue their course towards the glands situated near the iliac blood-vessels. Several small lymphatics, descending from the integuments of the abdomen and external organs of generation, enter a number of small glands arranged in a horizontal line in front of Poupart's ligament, and penetrate the femoral sheath with the former.

The superficial *nerves* of this region are derived from the genito-crural, anterior crural, and ilio-inguinal branches of the lumbar plexus.

Beneath the superficial fascia is situated the *femoral aponeurosis* (fascia lata), which envelopes the muscles of the

thigh, and which superiorly is divided into an iliac and a pubic portion. The *iliac portion*, after emerging from beneath the inferior pillar of the ring, forms a narrow band,

Fig. 50.



Femoral aponeurosis. Female.

which becomes gradually wider as it passes over the femoral vessels, forming what has been termed the *falciform process*; and in descending, its edge being crescentic, winds under the saphena vein, and becomes continuous with the *pubic portion*. The latter, ascending over the gracilis, adductor longus, and pectineus muscles, is attached superiorly to the ilio-pectineal line, where it is intimately blended with the internal aponeurosis of the abdomen; and, passing laterally behind the sheath of the femoral vessels to the border of the psoas muscle, divides into two layers, one of which adheres in front to the tendon of the psoas and iliacus muscles, whilst the other

passes posteriorly, and becomes blended with the capsule of the hip-joint. The *falciform process*, and the *crescentic edge* of the iliac portion of this aponeurosis, adhere closely to the anterior wall of the sheath of the femoral vessels; whilst the pubic portion, in passing behind the vessels, has its fibres closely connected with those of the posterior wall of the sheath. The oval space—well defined at its superior, iliac, and inferior borders by the falciform process and crescentic edge of the iliac portion of the aponeurosis, but less perfectly by the pubic portion,—is named the *saphenous opening*, which is covered by the cribriform fascia, and transmits the saphena vein, and the lymphatics of the thigh and groin, to the femoral sheath.

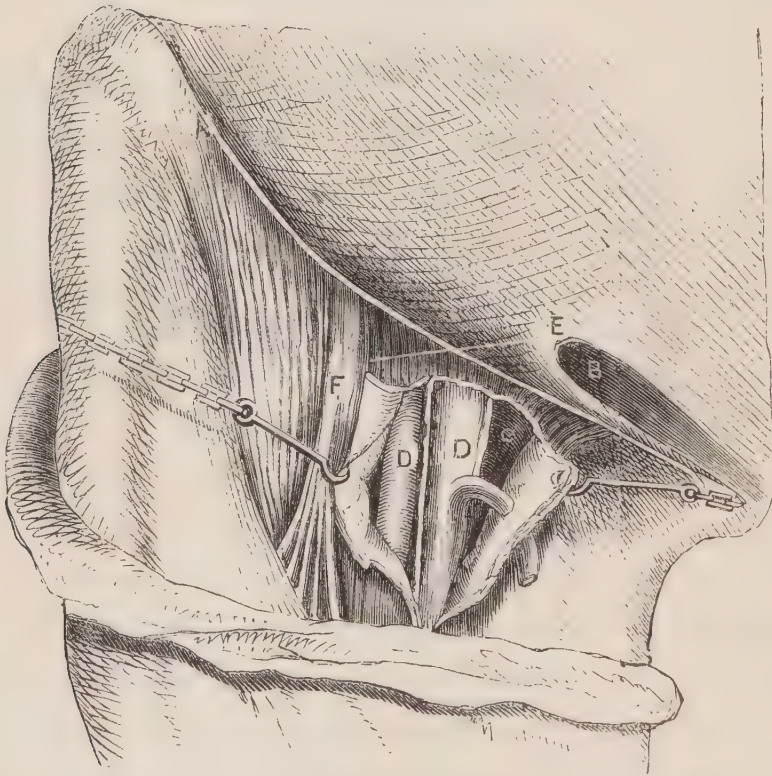
The *femoral ring*.—The large space between Poupart's ligament and the anterior border of the os innominatum is occupied at its iliac extremity, as far as the ilio-pectineal eminence, by the iliacus and psoas muscles, and the anterior crural and external cutaneous nerves; and at its pubic extremity, for about an inch in extent, by Gimbernat's ligament. The remaining portion of the space constitutes an irregular quadrilateral opening, named the femoral ring; which is bounded anteriorly by Poupart's ligament, posteriorly by the ilio-pectineal line, at its pubic side by the lunated border of Gimbernat's ligament, and at the iliac side by the conjoined mass of the psoas and iliacus muscles, and the anterior crural nerve covered by an aponeurotic expansion from the psoas parvus. This aperture constitutes the upper opening of the femoral canal, and lodges the commencement of the sheath of the femoral vessels.

The *femoral canal* extends from the femoral ring to the saphenous opening, which may be regarded as its inferior aperture. Its anterior wall is short, being formed by Poupart's ligament and the falciform edge of the femoral aponeurosis (*fascia lata*). The posterior wall is formed by the deep or pubic portion of the same aponeurosis, as it passes behind

the sheath of the femoral vessels upwards towards the linea ilio-pectinea. The iliac wall of the canal is formed by the aponeurotic expansion of the psoas parvus, which covers the psoas magnus and iliacus muscles. The direction of this canal is nearly vertical; its superior aperture being directed upwards and backwards towards the abdomen, its inferior aperture forwards and a little downwards.

The *femoral sheath* is a funnel-shaped prolongation of the internal abdominal aponeurosis, which invests the femoral vessels in their transit between the abdomen and thigh. The

Fig. 51.*



Femoral sheath and its contents. Female.

anterior wall of the sheath may be said to be formed by a descent or prolongation of the anterior portion of this apo-

* A. Poupart's ligament. B. Canal of Nuck. C. Pubic compartment of femoral sheath (generally the seat of hernial protrusion). D. D. Femoral artery and vein (former external, latter internal). E. Anterior wall of femoral sheath. F. Crural nerve.

neurosis (fascia transversalis), whilst the posterior wall of the sheath is formed by a prolongation of the posterior portion of the aponeurosis (fascia iliaca). In describing the formation of the anterior wall of the sheath by the fascia transversalis, Sir Astley Cooper states, that the latter structure consists of two portions or layers: one of which, descending along the *iliac* side of the internal ring, terminates in Poupart's ligament; whilst the other, descending along the *pubic* side of the internal ring, is prolonged downwards behind Poupart's ligament to form the anterior portion of the sheath of the vessels. "Thus," says Sir Astley, "a sheath is formed, enveloping the femoral artery, vein, and absorbent vessels, anteriorly by the descent of the fascia transversalis, posteriorly by a similar process from the fascia iliaca; and by the union of these at the inner and back part of the sheath the bag is rendered complete. At the upper part the sheath is broad, but, as it descends, it becomes more closely applied to the femoral vein and artery, giving it the appearance of a funnel; it is at the upper and inner part of this funnel that the absorbent vessels enter the sheath, giving it, as has been already remarked, a cribriform appearance: this part of the sheath is much looser in its texture than the portion investing the artery and vein, which is firm and unyielding."

Cloquet says, in reference to the iliac fascia: "In being continuous with the *transversalis fascia*, this aponeurosis represents a sort of fibrous *cul-de-sac*, which fills the angle formed by the iliac muscle and the anterior wall of the abdomen, and which opposes very powerfully the passage of the abdominal viscera below the external part of the crural arch. When we have destroyed these two aponeuroses, the peritoneum can be pushed by the finger very easily between the crural arch and the iliac muscle."—Cooper on Hernia, 2nd edit. by Key, part i. p. 9.

As far as I have been able to observe, the anterior wall of the sheath is formed by a general prolongation of

the anterior portion of the aponeurosis lining the transversalis muscle, and is constituted as much by fibres descending from the iliac as from the pubic side of the internal ring, or rather, of the mouth of the spermatic sheath. These fibres have already been described and represented in the description treating of the region of inguinal hernia. (See p. 206.)

The femoral sheath, gradually diminishing in size as it descends beneath the crural arch, and becoming more and more attenuated, is lost in the general filamentous envelope of the femoral vessels a little below the entrance of the saphena vein.

The upper and anterior part of the sheath adheres firmly to Poupart's ligament by an intermixture of aponeurotic fibres. A similar union exists between the sheath, and the falciform process and lunated edge of the femoral aponeurosis anteriorly, and the pubic portion of the femoral aponeurosis posteriorly.

Internally the sheath is divided into three spaces by two longitudinal partitions. The iliac space or compartment is occupied by the femoral artery, the middle by the femoral vein, and the pubic by the lymphatic vessels of the lower limb, and those of the integuments of the lower part of the abdomen. In this compartment there is always a more or less considerable quantity of fat; and sometimes a lymphatic gland is situated in it. A few lymphatic vessels occasionally accompany the vein into the abdomen.

The anterior and upper part of the sheath, for a few lines below the level of Poupart's ligament, is strengthened by a series of transverse fibres, which have been described by Mr. Key as frequently occasioning the stricture in femoral hernia. The resistance which these fibres afford is readily perceived by pushing the finger from the abdomen into the pubic compartment of the sheath, after the peritoneum has been removed, and Poupart's ligament has been entirely cut away.

It is into the pubic compartment of the femoral sheath that a femoral hernia descends.

The vessels are connected to the several compartments of the sheath by filamentous tissue, which is continuous with the subserous tissue of the abdomen. This tissue, in the neighbourhood of the femoral sheath, is loose and abundant, often much loaded with fat, and sometimes condensed at the ring, so as to form an imperfect barrier, named by M. Cloquet the *crural septum*.

The *peritoneum*, in the vicinity of the femoral ring, presents a strongly marked depression on the pubic side of the large femoral vessels. This depression is situated in the lower part of the pouch, which was formerly described as situated on the iliac side of the umbilical ligament; but which, in irregular distribution of the umbilical artery, is sometimes placed so far from the pubes as to allow the peritoneal fossa, on its pubic side, to be in apposition with the femoral ring. Thus, under ordinary circumstances, the sac of a femoral hernia is derived from the peritoneal pouch on the iliac side of the umbilical ligament; but, under irregular distributions of the umbilical artery, from that on its pubic side. The peritoneum, from being loosely attached in the vicinity of the femoral ring, readily furnishes a sac to visceral protrusions occurring in this situation.

The *epigastric artery* ascends obliquely at the *iliac* side of the femoral ring, and about half an inch distant from it. Varieties in its origin, however, occur; and, when it arises lower than usual, it approaches nearer to the ring.

The *obturator artery*²³¹ usually arises from the internal iliac, and pursues its course to the obturator opening, remote from the locality of femoral hernia; but it is also subject to frequent irregularities in its origin, and to consequent deviations from its natural course, which may become of importance in connexion with femoral hernia. In 500 dissections made by M. J. Cloquet,²³² the obturator artery arose from the

internal iliac in 348, and from the epigastric artery, or from the femoral, in 152. In those in which it was found to arise either from the epigastric or femoral, 58 were in subjects of the male sex, and 94 in females. Hesselbach,²³³ in 64 instances, found the obturator originating from the internal iliac in 36, and either from the epigastric or from the femoral in 28. From M. Velpeau's²³⁴ investigations it would appear that these irregularities are much less frequent, for he affirms that he has not observed them to occur in a larger proportion than 1 in 15 or 20; but the experience of Tiedemann²³⁵ is opposed to this, and coincides with the results of Cloquet's and Hesselbach's researches.

Although these irregularities are of such frequent occurrence, it will be hereafter shewn that the artery pursues such a course as would expose it to risk in the operation for femoral hernia only in a small proportion of cases, and that there is less danger of its being wounded in the operation than would at first be apprehended. (See account of Operation for Strangulated Femoral Hernia.)

2. DEVELOPEMENT AND ANATOMICAL CHARACTERS OF FEMORAL HERNIA.

On the occurrence of femoral hernia, a pouch of peritoneum is protruded into the pubic compartment of the femoral sheath, forming with its visceral contents a projection of an hemispherical form, which is imbedded in a condensed layer of subserous tissue, fat, and lymphatics, named by M. Cloquet the *crural septum*.

As the hernial protrusion generally occupies only the compartment at the pubic side of the femoral sheath, it is, of course, separated from the middle compartment, containing the femoral vein, by the partition or septum between them. It is separated from Poupart's ligament by the *anterior* wall of the compartment; from the pubic portion of the femoral aponeurosis, where the latter passes up over the

pectineus muscle and horizontal branch of the pubes to be attached to the ilio-pectineal line, by its *posterior* wall; and from the crescentic edge of Gimbernat's ligament by the *pubic* wall.

The hernia, in this incipient stage, causes no visible tumefaction, being concealed by Poupart's ligament and the falciform process of the femoral aponeurosis. The presence of femoral hernia in this early stage may nevertheless be recognized by means which will hereafter be described.

The hernia advancing gradually loses its hemispherical form, and becomes more cylindrical, as it descends along the pubic compartment of the sheath, until it approaches the level of the semilunar edge of the femoral aponeurosis.

A slight fulness of the sheath is now perceptible, and becomes more obvious when the patient coughs or otherwise exerts the abdominal muscles.

The viscera, which have descended below Poupart's ligament and the falciform process, are covered by the peritoneum, the subserous tissue containing fat and lymphatics, the femoral sheath, the cribriform fascia, and the common integuments of the thigh.

The hernia, in these early stages, may be regarded as *interstitial*, since it has not yet emerged from within the muscular and aponeurotic structures of the abdomen and thigh.

As the protrusion increases, its further descent in the course of the vessels is prevented by the resistance offered by the lunated edge of the femoral aponeurosis, which adheres firmly to the sheath of the vessels; but, from experiencing less resistance at the saphenous opening, it advances forwards through this aperture, pushing before it the sheath of the vessels and the cribriform fascia.

The projecting part of the tumour now gradually expanding usually appears of a globular form, and attains a magnitude of one, two, or three inches in diameter, whilst its neck

remains of nearly its original size. Consequently, the neck of the sac, in this stage and species of hernia, is narrow and directed downwards; whilst the body is expanded, and proceeds from the neck, almost at a right angle, in a direction forwards.

The hernia having projected beyond the saphenous opening, covered by the sheath of the vessels and the cribriform fascia, has now only to encounter the loose external layer of subcutaneous tissue and the skin, and therefore expands pretty uniformly in all directions; except in some instances, where the bending of the thigh upon the abdomen favours its growth in a transverse direction, or where gravitation, operating upon a large hernia, causes it slightly to descend upon the thigh. It thus usually projects over the semilunar edge of the femoral aponeurosis below, and over Poupart's ligament above, encroaching in the latter direction upon the site of inguinal hernia. This encroachment is not, however, produced by the entire tumour turning upwards, as has frequently been represented; but is simply the result of the general enlargement of the body of the sac in comparison with the aperture through which it has escaped.

The size of femoral hernia is usually small, compared with that of inguinal. It nevertheless, in some instances, attains considerable magnitude, and has been known to descend half-way down the thigh. A case of femoral hernia in the male-subject, in which the tumour was as large as two fists, was admitted a few years ago into the Leeds Infirmary under my care, and required operation. The patient recovered.

Anatomical relations. — The neck of the hernial sac is separated from the femoral vein by the subserous tissue of the sac, and by the membranous partition which separates the inner compartment of the femoral sheath from that containing the femoral vein.

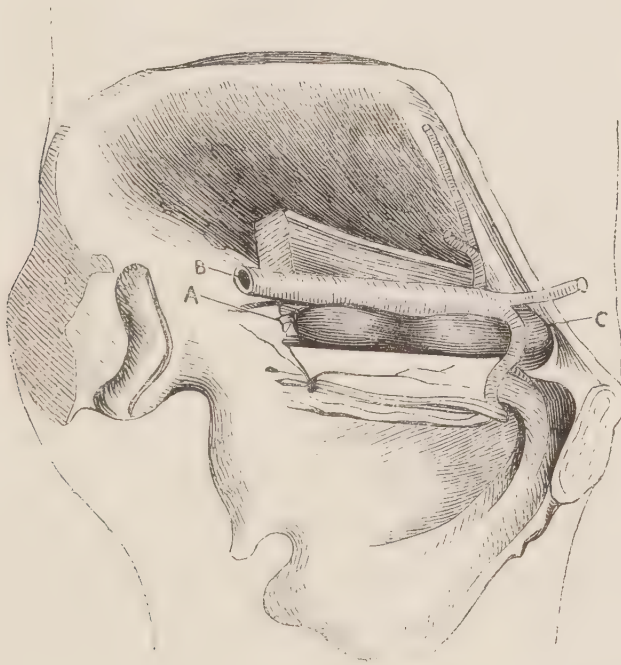
The epigastric artery, usually arising from the external iliac about half an inch from the mouth of the sac, approaches

somewhat nearer the sac as it ascends obliquely towards the rectus muscle.

The spermatic vessels, and the round ligament, imbedded as it were in the substance of Poupart's ligament, pass anteriorly to the mouth of the sac, and a little above it, at a distance of three or four lines.

The sac of a femoral hernia is usually derived from the pouch of peritoneum on the pubic side of the ligamentous remnant of the umbilical artery. But, when the artery has ascended nearer to the pubes than usual, the sac may be derived from the peritoneal pouch on the iliac side of the ligament. An instance of this peculiarity is recorded by Sir A. Cooper.²³⁶

Fig. 52.*



Obturator artery arising from the external iliac, and descending on the iliac side of the femoral ring.—After Quain.

The *obturator artery*, subject to irregularities in its course, frequently exhibits important relations to femoral hernia.

* A. External iliac vein. B. External iliac artery. c. The obturator artery.

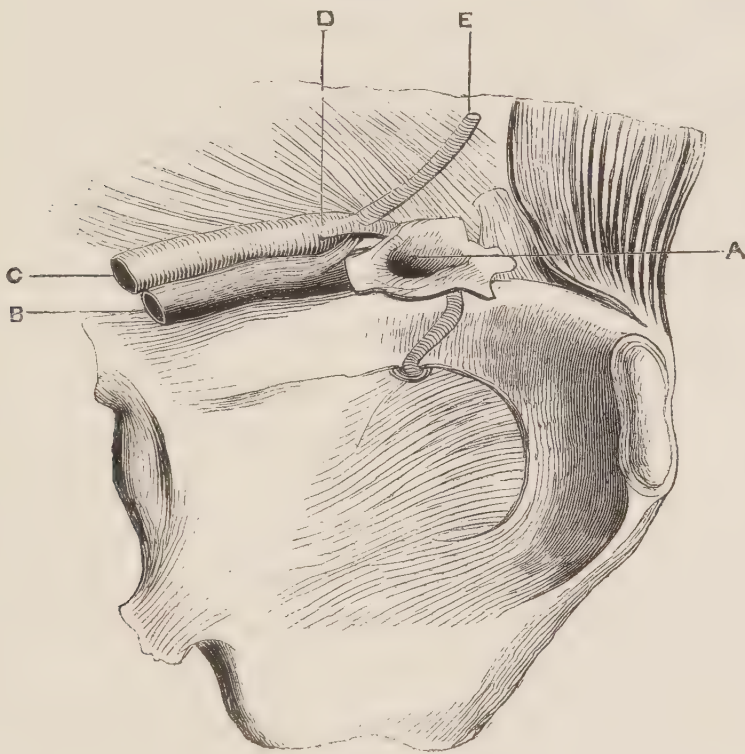
In all those instances in which this vessel is derived from the epigastric, the femoral, or the external iliac, it descends to the obturator opening in close proximity to the hernia, and either pursues its course along the iliac side of the mouth of the sac (see fig. 52), free from all risk of being wounded in the operation for strangulated femoral hernia; or it winds over the mouth of the sac, and descends along its pubic side, exposed to great peril from the knife. (See fig. 53.)

Anastomosing branches between the epigastric and the obturator arteries, traversing the site of femoral hernia, may also be a source of danger in the operation.

Since then the obturator artery, from irregularities in its origin and course, may be exposed to danger in the operation for femoral hernia, it is important to form an estimate of the relative proportion of cases in which it pursues a dangerous course. From the united observations from dissection of Sir A. Cooper, M. Cloquet, and Mr. Quain, it appears that the obturator was more or less directly derived from the external iliac in one-fourth of the cases; and that it had normal origin from the *internal* iliac in the remaining three-fourths. But it is probable that this is a more frequent irregularity than exists in actual cases of femoral hernia; inasmuch as the situation of the artery may probably have some tendency to prevent a protrusion, from the resistance offered by its passing over the femoral aperture. And the result of Sir Astley Cooper's investigations tends to confirm this opinion, for in 21 cases of femoral hernia which he dissected he found the obturator to have its origin from the epigastric, or rather from the common trunk of these arteries as it arises from the external iliac, six times, which is in the proportion of 1 to $3\frac{1}{2}$. Although the irregularity of origin of this artery may be calculated upon in femoral hernia in the proportion just stated, yet in a great number of such irregularities the artery even descends on the iliac side of the sac, and out of the reach of danger from the knife. Indeed, Sir A. Cooper supposed

this to be the usual course of the vessel when it is derived directly or indirectly from the *external* iliac ; and it was actually the course which it pursued in all the six cases just alluded to. Sir Astley has, however, quoted a case from Dr. Barclay, in which the trunk common to the epigastric and the obturator passed over the mouth of the sac, and the latter vessel descended on its *pubic* side. He also mentions two instances of the same distribution of the vessel sent to him by Mr.

Fig. 53.*



The Obturator artery arising from the epigastric, and descending on the pubic side of the femoral ring.—From a preparation presented to the College of Surgeons by Mr. Liston.

Wardrop. Mr. Lawrence²³⁷ states, that in the Museum of St. Bartholomew's Hospital there are two examples of double femoral hernia in the male, with the obturator arising from

* A. Mouth of the sac of femoral hernia. B. External iliac vein. C. External iliac artery. D. Common trunk, giving off the epigastric and obturator arteries. E. Epigastric artery. F. Obturator artery.

the epigastric artery on each side. In three of these herniæ the obturator runs on the *pubic* side of the mouth of the sac. Dr. Monro has seen three such cases;²³⁸ and he alludes to one which occurred to Mr. Burns.²³⁹ A case is mentioned by Breschet,²⁴⁰ and another is quoted by Scarpa; and an instance of this important variety in the course of the obturator artery is here figured, from a specimen presented to the College of Surgeons by Mr. Liston (fig. 53).

Facts have not yet been accumulated in sufficient numbers to enable us to decide the proportion of cases of femoral hernia with irregular origin of the obturator artery, in which this vessel pursues what may be termed a dangerous course; but ample evidence is here adduced to shew that such an unfortunate combination of circumstances does occasionally occur. The surgeon, fully impressed with the importance of this fact, ought therefore to limit his incision of the stricture in femoral hernia to the smallest extent consistent with the liberation of the protruded parts, and, should the obturator unavoidably be divided, he must be prepared to act in this emergency with the utmost calmness and promptitude.

A few instances have been recorded in which the hernia, instead of entering the pubic compartment of the femoral sheath, has descended either in front of the femoral artery and vein, or to their iliac side, or posteriorly to them. M. Cloquet²⁴¹ has witnessed the hernia descending in front of the femoral artery and vein, and the epigastric artery ascending along the pubic border of the neck of the sac. Hesselbach has seen the hernia in front of the vessels. He has also met with one instance in which the protrusion occurred on the *iliac* side of the vessels. The tumour was covered by the femoral aponeurosis, and the circumflexa ilii passed in front of the neck of the sac.²⁴² Mr. Macilwain²⁴³ states, that, in several thousand examples of femoral hernia at the Truss Society's Institution, six instances of descent on the iliac side of the femoral artery are recorded; but, as observed by Mr.

Lawrence, since the situation at which the protrusion had occurred was not ascertained by examination after death in any of these six cases, it remains doubtful, so far as this evidence goes, whether they really presented examples of deviation from the ordinary situation of femoral hernia. Mr. Stanley,²⁴⁴ however, has met with two instances in the dead body. In each, the sac was small, wide at the mouth, and empty. It passed out of the abdomen close to the femoral vessels, and was placed in front of them. In one of these instances the epigastric artery arose from the femoral, from a trunk common to it and to the obturator. The common trunk, with its two branches, passed in front of the sac. M. Cloquet states, that he has seen an instance in which the hernia was situated behind the femoral vessels, and separated from them by the "deep layer of the fascia lata."²⁴⁵ How the hernia attained this position it is difficult to imagine.

Considerable variety is observed in the condition of the coverings of femoral hernia. When the tumour is small and of recent formation, the common integuments, cribriform fascia, femoral sheath, subserous tissue, and the sac, present but little deviation from their natural structure. But frequently, more especially in large herniæ, the cribriform fascia is closely adherent to the structures external to it, and is divided in conjunction with them at the time of operation. The subserous tissue is also subject to great varieties. In small herniæ it is often thicker than the sac; in large but recent herniæ, from being more expanded, it is thinner. In old herniæ it is often much increased in thickness from interstitial deposit, being divisible into several layers, and containing enlarged lymphatic vessels and glands, and masses of fat, which are sometimes so indurated as to resemble omentum.²⁴⁶

The usual contents of femoral hernia are intestine, most frequently the ileum, often accompanied with omentum. The omentum alone is but rarely found in femoral herniæ. Hes-

selbach²⁴⁷ has seen the ovarium and Fallopian tube in a left femoral hernia; and Professor Lallement²⁴⁸ has also seen a right femoral hernia, in an aged female, consisting of the uterus, Fallopian tubes, ovaries, part of the vagina, and a portion of the omentum. Verdier²⁴⁹ has recorded an instance in which the bladder was the part protruded.

3. COMPLICATIONS OF FEMORAL HERNIA.

Femoral hernia has been known to co-exist with inguinal. Such a complication has been noticed by M. Malgaigne; and Mr. Lawrence states, that in the Museum of St. Bartholomew's Hospital there is a preparation exhibiting an oblique inguinal and a femoral hernia on each side in a male subject. A patient was lately admitted into the Leeds Infirmary under the care of Mr. Smith with two inguinal and two femoral herniæ.

Serous cysts are occasionally developed in the vicinity of femoral hernia. An interesting case of this kind occurred to Professor Samuel Cooper,²⁵⁰ who opened several cysts filled with a sanguinolent fluid before reaching the hernial sac. Sir Charles Bell²⁵¹ has observed, that the sac is sometimes covered, not only with lymphatic glands, but also with vesicles containing serum, which give to the tumour a great irregularity. It has been shewn by M. Cloquet, that a serous cyst in the vicinity of a hernia sometimes results from the closure of the neck of an old hernial sac, and from a new protrusion taking place by its side.

Callisen,²⁵² operating upon a femoral hernia, after having divided the external envelopes, exposed a tumour which was supposed to be the hernia, but on further examination proved to be an enlarged gland. Pursuing the dissection behind the gland, he discovered a very small femoral hernia. Schroeder, having made an incision over a tumour in the groin supposed to be hernia, exposed an inflamed gland: an emollient poultice was applied to it. The patient died in

three days, and on examination the tumour was indeed formed by a gland; but, on opening the abdomen, it was also ascertained that a minute portion of the calibre of the small intestine had descended behind Poupart's ligament, and was strangulated.

The external characters of an enlarged gland situated within the femoral sheath bear the closest resemblance to those of femoral hernia; and, should such a tumour co-exist with the symptoms which usually indicate strangulation, the surgeon ought not to hesitate to expose it by incision; and, should this prove to be gland, the cases related above shew that the utmost circumspection is necessary to avoid overlooking a co-existent hernia.

4. CONDITIONS OF FEMORAL HERNIA.

The reducible and the irreducible conditions of femoral hernia do not require any further observations than those which have already been made in the description of those conditions in hernia in general; but, when strangulated, it becomes necessary to inquire into the important question as to the seat of stricture in this form of hernia.

Many surgeons have erred by considering some particular structure as the invariable seat of stricture in femoral hernia. Thus, some have strenuously maintained that Gimbernat's ligament is the constricting part; whilst others as positively affirm that the neck of the sac is the exclusive seat of stricture. There can be no doubt that the stricture in femoral as well as in inguinal hernia is variously seated. The constriction may either be caused by the femoral arch, of which Gimbernat's ligament forms a part,—by the sheath of the femoral vessels,—by the neck of the sac,—or by membranous bands or adherent portions of omentum within the sac.

That the femoral arch or ring may exert a constricting influence, is evident from the strongly indented impression of Gimbernat's ligament which the intestine frequently exhibits;

but this very mark, which proves that serious resistance to the pressure of the protruded part has been exerted by the femoral arch, has frequently given rise to the supposition that the special seat of the constriction was Gimbernat's ligament. Whereas this resistance must have been equally exercised at all parts of the circumference of the ring, its effects only being more serious and obvious in the site of that sharp-edged ligamentous band than of the broader surface of other parts of the femoral ring:—indeed, the fact of the mark itself being present is sufficient to shew this; since, if Poupart's ligament had not been on the stretch from the pressure of the hernia, the crescentic edge of Gimbernat's ligament would not be so sufficiently tense as to cause such a mark. It is equally obvious, then, that the stricture in this case would be as effectually relieved by division of the femoral arch at any practicable point as at Gimbernat's ligament; and, as the director can be more readily introduced behind Poupart's ligament, the most prudent course would be to release the protruded parts from stricture, by dividing the posterior and inferior border of that ligament, rather than incur the risk of lacerating the indented and attenuated coats of the intestine by passing the director between them and the sharp edge of Gimbernat's ligament.

The sheath of the femoral vessels, however, is perhaps the part which *most frequently* constricts a femoral hernia. Sir Astley Cooper was the first to direct attention to this fact, which has been subsequently confirmed by the observations of Mr. Key.²⁵³ It has already been shewn that the femoral sheath, in passing behind Poupart's ligament, adheres firmly to the latter by an intermixture of aponeurotic fibres; and that, below this adhesion, the femoral sheath for several lines is strengthened by a series of transverse fibres, which offer considerable resistance to the finger when placed within the sheath. These fibres frequently resist the replacement of the protruded viscera. Many instances have occurred in which

the hernia has remained strangulated by this portion of the sheath, even after Poupart's and Gimbernat's ligaments have been cut away.

The neck of the sac as a seat of stricture has already been considered. It may here further be remarked, that it has been frequently disputed whether the firm fibrous structure, sometimes developed around the neck of the sac, be a morbid transformation in the sac itself or in the subserous tissue. This is, indeed, a question not easy of decision, since by unaided vision it is next to impossible to observe the actual line of demarcation between the intrinsic elements of serous membranes and the subjacent filamentous tissue. But when we tear an old hernial sac from its connexions, and find that the adventitious fibrous structure is removed along with it, and appears to be incorporated in its very substance; and when we find, as in the case of "reduction en bloc," in which the hernia still strangulated has been pushed into the abdomen enveloped in its sac, that the newly formed fibrous structure has been displaced along with the sac, and, conjointly with it, strangulates the viscera; we cannot hesitate in such cases practically to regard the stricture as formed by the indurated and thickened neck of the sac.

As already stated, membranous bands and adherent portions of omentum may also sometimes constrict the viscera.

It is thus evident that the stricture in femoral hernia is not invariably seated in any particular structure, but that various textures are occasionally its seat. Great, indeed, would be the advantage if we were able before operation to determine the seat of stricture; but, unfortunately, this is not within our power, and our attempts at diagnosis in this point scarcely lead us beyond the range of probability. In any given case of femoral hernia, the stricture may be formed either by the sheath of the vessels, or by the femoral ring. In a femoral hernia, which has recently

protruded externally, it is not to be expected that the stricture is formed by the neck of the sac; but in a hernia of old standing, more especially if a truss have long been worn, it is not improbable that the viscera may be constricted by the neck of the sac.

Although the surgeon cannot, before the operation, determine with certainty the seat of stricture, yet a knowledge of the various structures in which it may possibly be seated, will exert an important influence on the mode of his proceeding.

5. SYMPTOMS AND EXTERNAL CHARACTERS.

In the earliest stage of femoral hernia, when there is merely a small hemispherical protrusion into the pubic compartment of the femoral sheath, without external tumour, the disease may, by careful examination, be recognized. For the mode of detecting the hernia in this early stage we are indebted to the investigations of M. Malgaigne.²⁵⁴ Whilst the pulp of the fore-finger is firmly applied immediately below Poupart's ligament on the pubic side of the femoral artery, the patient must be directed to cough; when, if hernia exists, the finger will be repelled by a pressure from within. In order to establish the value of this sign, M. Malgaigne first inquired whether the viscera in their natural position did not during the act of coughing communicate an impulse below the femoral arch. His observations were made on the living body in persons of both sexes, of all ages, and of every variety of size and form. In a very small proportion of these subjects was he able to recognize this impulse; and in these instances he inferred that the impulse was not a natural condition, since he found that it existed on one side and not on the other. He further endeavoured to confirm this opinion by a series of experiments on the dead body, from which he feels justified in announcing the following proposition as a general law: "As long as the peritoneum does not protrude

behind the femoral ring, no impulse is perceptible externally below the femoral arch : but whenever a bulging of the peritoneum, which is the first stage of femoral hernia, is perceptible in the dead body, a decided impulse may be felt externally when the finger is plunged into the sac." In healthy subjects, having first ascertained that no impulse was perceptible, he pushed the peritoneum within the ring, and produced, as it were, a hernial sac, and immediately the impulse became manifest. By attention to this sign in a subject having an obvious femoral hernia on one side, he has frequently been enabled to detect the disease in the incipient stage on the other.

Sir Astley Cooper has stated that he has often found femoral hernia on both sides in the dead subject, which had not been known to exist during life.

In a more advanced degree of the interstitial stage of femoral hernia, when it has descended below Poupart's ligament, but has not protruded through the saphenous opening, the hernia slightly elevates the cribriform fascia, and is not only now perceptible to the touch, but also to the sight.

After having still further protruded the cribriform fascia, and escaped from the boundaries of the saphenous opening, it forms a tumour, usually of a rounded form, but sometimes oval or oblong, generally more or less overlying Poupart's ligament, and also the other boundaries of the saphenous opening.

Although many inguinal and femoral herniæ are so strongly marked that we cannot hesitate for a moment to decide upon their respective characters, yet it must be admitted that hernial tumours at the groin frequently occur, which require the greatest care for their discrimination.

Various modes have been suggested for determining whether such herniæ are femoral or inguinal ; but most of them, under certain circumstances, are doubtful or fallacious. Sir Astley Cooper considered that the position of the neck of the sac,

in reference to the spine of the pubes, afforded a correct means of diagnosis; the sac of inguinal hernia being placed above, while that of femoral is below, and to the iliac side of the spine. But a relaxed state of the inferior pillar of the ring, or a deficient developement of the intercolumnar fibres, occasionally allows an inguinal hernia to be placed below, and to the iliac side of the spine of the pubes. Sir Astley further states, that, if the sac of a femoral hernia be drawn downwards, the femoral arch may be traced above it. The latter mode of diagnosis is, however, in most instances only available when the parts are exposed by operation.

It has also been supposed that all herniæ placed above a line drawn from the spine of the ilium to the spine of the pubes are inguinal, whilst those which are situated below this line are femoral. But Poupart's ligament, which this line is supposed to represent, does not usually describe a straight line; and Poupart's ligament is so much relaxed and curved downwards, particularly in women who have borne children, as actually to allow many inguinal herniæ to be situated below the line.

M. Malgaigne proposes to rectify these defective means of diagnosis by adopting the following procedures. He supposes a case the most difficult of diagnosis, namely, one in which there is a tumour, possessing the characters of hernia, situated in the groin about its middle, but somewhat nearer to the pubes, projected on coughing, and receding so suddenly on pressure that it is impossible to discover the point at which it has disappeared; the external ring being free, but apparently lying in the direction of the hernia, which is placed somewhat below a line drawn from the spine of the ilium to the spine of the pubes. On attempting to trace Poupart's ligament, it is found to be relaxed, difficult to be felt, and apparently directing itself towards the middle of the tumour; but whether passing above or below, it is impossible to determine. How are we in such a case, which defies the ordinary

means of diagnosis hitherto proposed, to decide upon the character of the hernia?

M. Malgaigne thus directs us:—"Reduce the hernia, feel with the right fore-finger the pulsations of the femoral artery, and, applying the pulp of the finger on the pubic side of the artery, press backwards towards the pubes. Sometimes, in thin persons you will feel the femoral ring open, bounded in front by Poupart's ligament, behind by the pubes, on the iliac side by the vein and artery, the pulsations of the latter being felt through the interposed coats of the vein on the side of the finger: then it is unnecessary to proceed further; in the natural state, the finger never could thus penetrate into the femoral ring. But suppose the subject to be fat, the hernia small, and the ring too deep and narrow to admit the finger; you must press against the pubes, whilst you perceive the pulsations of the artery against the side of the finger, and cause the patient to cough. If the impulse is felt by the finger, and the hernia does not escape, it is femoral; but if the impulse is not perceived, and the hernia escapes above, it is inguinal. Occasionally an inguinal hernia escapes above, and at the same time communicates an impulse to the finger. This effect can only result from one of the two following cause: either it is an inguinal hernia which distends the inguinal canal, and transmits an impulse below Poupart's ligament; or the hernia is femoral, and has distended and pushed forward Poupart's ligament, and a portion of the aponeurosis of the external oblique, so as to cause a projection above the ring which you have obstructed. You then with the right fore-finger close the femoral ring, and, having placed the left thumb transversely about three lines above it, cause the patient to cough, whilst you slowly withdraw the fore-finger. If the hernia be inguinal, it is thereby retained; if femoral, it protrudes."

These directions are only applicable to reducible herniæ. When from any cause the protrusion is irreducible, the sur-

geon must endeavour to trace the neck of the sac issuing from beneath Poupart's ligament. This is most effectually done (when the line of Poupart's ligament cannot be satisfactorily traced passing over the tumour) by pushing the hernia upwards, and pressing with the pulp of the fore-finger in the direction of the femoral aperture. If the hernia be femoral, more especially if it be strangulated, a firm, resisting, and sometimes painful substance will be found occupying the femoral ring, and preventing Poupart's ligament from being felt.

Varicose femoral and saphena veins.—A tumour is sometimes produced by a varicose enlargement of the femoral or saphena veins, which bears some resemblance to hernia. It is dilated on coughing; disappears in the recumbent, and is reproduced in the erect posture. It is readily known by the facility with which it is made to appear by pressure above the femoral arch, although the patient remains recumbent. The tumour occasionally exhibits a violet tint of colour, and is often accompanied by a varicose state of the saphena in other parts of its course, and of the other superficial veins of the leg. J. L. Petit saw a young woman supposed to be labouring under hernia. She had a tumour in the groin as large as a hen's egg, which disappeared when she was recumbent, enlarged when she was engaged at her work, and caused considerable pain in the affected limb, increased by the previous pressure of a truss recommended to be worn by an itinerant charlatan. From the bluish colour of the skin, and from the varicose state of the saphena, Petit at once decided that the tumour was formed by an enlargement of the femoral vein.

Psoas abscess.—The tumour²⁵⁵ formed by this disease frequently projects below the femoral arch, and may be mistaken for femoral hernia. The tumour is indolent, dilates on coughing, becomes rather fuller in the erect posture, and disappears more or less completely on pressure. The previous

history of the disease, and the detection of fluctuation, will sufficiently establish its character.

Enlarged lymphatic glands situated over or within the femoral sheath sometimes closely simulate an irreducible or strangulated femoral hernia. These may generally be distinguished by the greater mobility of the swollen gland when situated externally to the sheath; and by its often admitting of being grasped by the fingers, and elevated from the parts beneath. When the glands are lodged within the sheath, these characters altogether fail; and the surgeon has little else to guide his judgment than the absence of symptoms indicative of intestinal disease. Should the symptoms of obstruction of the bowels co-exist with a tumour of dubious character in the situation of femoral hernia, he is fully justified in removing all doubt by exposing such tumour by incision.

6. STATISTICS AND CAUSES OF FEMORAL HERNIA.

It is universally admitted that femoral hernia is more frequent in females than in males; and on the right, than on the left side. These facts are generally borne out by a reference to the tables of the New Rupture Society of London, and to those of M. Cloquet, and of the Leeds Infirmary; as well as by the opinions of Sir Astley Cooper, Mr. Lawrence, Hesselbach, and numerous other writers. Even M. Malgaigne affirms that women are undoubtedly more predisposed to femoral hernia than men. But although these general statements may be regarded as established, yet we are unable to state with anything like precision the actual proportion of femoral herniæ occurring in the two sexes; for there can be no doubt, as shewn by M. Malgaigne, that, in the construction of all existing tables, the diagnostic marks of inguinal and femoral herniæ have not been sufficiently regarded in determining the characters of obscure cases of these two affections.

Age exerts a remarkable influence in the production of femoral hernia. Prior to the age of twenty, it is extremely rare. Sir Astley Cooper had only seen three instances,—namely, at the age of seven, eleven, and nineteen years. M. Malgaigne, during five years of his attendance at the Bureau Central, where many thousand cases of hernia came annually under his observation, did not see one female affected with femoral hernia before the age of twenty. After that period until advanced age, femoral hernia appears to originate equally at all periods of life.

Of 14 femoral herniæ observed by M. Malgaigne in men, one occurred in infancy, the others at the following ages:—3 from 23 to 28 years; 3 from 35 to 39 years; 3 from 42 to 48 years; 1 at 50 years, and 3 from 60 to 68 years of age.

M. Nivet, after investigating 65 femoral herniæ in women, obtained the following results:—1 occurred before 15 years; 11 from 15 to 30 years; 18 from 30 to 45 years; 16 from 45 to 60 years; 15 from 60 to 75 years; 4 from 75 to 85 years of age.

The greater predisposition in females may be attributed to the greater width and depth of their femoral arch, which again is traversed by smaller muscles than in men; and probably also to the general relaxation of the abdominal walls after pregnancy, since femoral hernia is rare in women who have not borne children. In men, during the prime of life, the predisposing causes to this species of hernia are less numerous and efficient; but the exciting causes, namely, active exercises or any violent exertion of the abdominal muscles, operate more powerfully in them than in females; and, in advanced age, the shrinking of the psoas and iliacus muscles, by leaving the femoral arch less occupied, as well as the general relaxation of the tissues in old age, may favour the production of the disease.

The generally received opinion, that femoral hernia is much more frequent in females than inguinal, has lately been called

in question by M. Malgaigne, who advances the startling assertion that inguinal herniæ in females are the most numerous.²⁵⁶ He admits that femoral hernia is more frequently the subject of operation in women; but this fact, he maintains, only proves that femoral hernia is more liable than inguinal to strangulation. He admits, also, that truss-makers, who are chiefly engaged with reducible herniæ, and societies instituted for providing hernial bandages, report that inguinal hernia is comparatively rare in females: the London Truss Society estimating inguinal to femoral as 1 to 15;—Mathey, of Antwerp, as 1 to 7;—and Monikoff, of Amsterdam, as 1 to 4. It is impossible, says M. Malgaigne, that such a difference can exist in the constitutions of the women of London and of Antwerp as to account for these different results; and he is of opinion that they can only be explained by the inaccuracy of diagnosis on the part of the observers. By establishing the more correct mode, to which we have already referred, of investigating these different affections, he was surprised to find that inguinal herniæ actually predominated over those of the femoral variety. Of 62 females affected with hernia in the groin, whom he examined in October and November 1835, 54 had inguinal hernia, 7 femoral, and 1 both inguinal and femoral. He avows that this proportion was greater than he observed in his subsequent investigations, but he invariably found that inguinal herniæ were the most numerous.

These statements, so contrary to the received opinions, must necessarily arouse the attention of surgeons to the important, and in many instances difficult, subject of the diagnosis of these two species of hernia; but whilst I am willing to admit that many inguinal herniæ have from defective diagnosis been reported as femoral, and am willing moreover to give M. Malgaigne every credit on this subject, I am not at present prepared altogether to acquiesce in his statements, either from my own experience, or, above that,

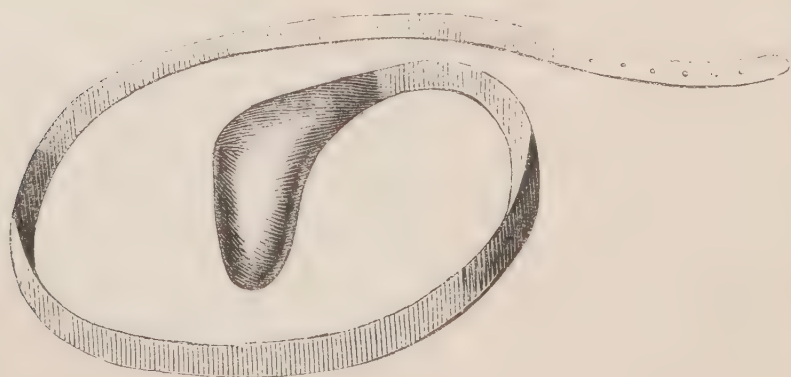
from the experience of M. Cloquet, who examined *post mortem* 121 women affected with hernia, and found that 42 were affected with the inguinal, and 79 with the femoral variety of hernia.

7. TREATMENT.

a. Reducible femoral hernia.—From the form and structure of the femoral canal, trusses rarely, if ever, produce a radical cure of this disease, and their employment can only in general be regarded as a palliative measure. But although we are scarcely able to produce a complete closure of the aperture through which the hernia has descended, yet, by the judicious application of trusses, we can greatly mitigate the distressing symptoms which attend an unsupported femoral hernia, as well as diminish the risk of strangulation. A large pad ought to be discarded in trusses for femoral hernia, since it is perpetually liable to displacement during progression, from the contraction of the pectineus muscle on one side, and of the psoas and iliacus on the other. By the action of these muscles, a large pad is elevated and the hernia escapes. It is important, also, that the pad should not advance so far as to press upon the pubes; for, by its resting upon this firm unyielding structure, a great portion of the force of the spring is removed from the part upon which it ought more especially to be concentrated.

The *single common truss* (fig. 54) for femoral hernia

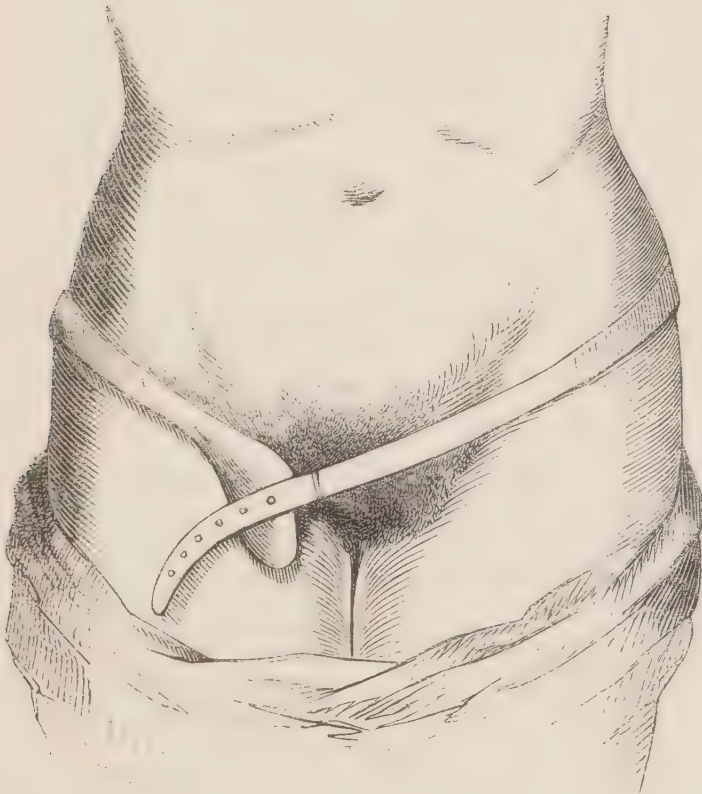
Fig. 54.



Single femoral truss.

should have the pad of a triangular form, narrow transversely, and somewhat elongated from above downwards; its base corresponding with the edge of Poupart's ligament. The pad should be of size sufficient to close the saphenous opening, but should only extend to a very limited distance beyond the borders of this aperture. Its convexity should constitute a rather prominent ridge, directed from above downwards, situated a little towards the pubic side of the pad, commencing about a finger's breadth below its upper edge, and extending downwards to the apex, towards which part it should gradually diminish. A pad thus constructed gently closes the

Fig. 55.



Single femoral truss applied.

external aperture, namely the saphenous opening; and its most intense pressure is directed to the pubic side of the vein. The vessels are thus subjected to as moderate a degree of pressure as is consistent with the support of the hernia,

and the pressure is concentrated upon the part which more especially requires support. The spring of the truss may be constructed upon the same principle as that for inguinal hernia, except that at its anterior extremity the curve from the haunches should sweep in a course somewhat more descending; and great care should be taken that the anterior extremity of the spring impinge directly upon that part of the pad which is the most prominent—namely, a point near the centre, but a little inclined to its upper and pubic borders. The anterior portion of the spring, that which extends from the haunch of the patient to the pad, is usually an inch and a half shorter than in the inguinal truss. The angular turn which the anterior extremity of the spring and the pad, as constructed by some truss-makers, sometimes form, subjects the instrument to displacement during the movements of the thigh and trunk, and is attended with great sacrifice of power in the spring.

By the use of this truss an external protrusion of the hernia may be prevented; but it may be doubted whether a slight degree of interstitial protrusion does not always remain under the employment of the best-constructed trusses for femoral hernia.

The measurement for this femoral truss is taken by fixing a piece of tape with the finger upon the site of the aperture through which the hernia escapes, and carrying the tape round the pelvis, midway between the trochanter and the spine of the ilium, to the point from which the measurement began.

The *double common truss* for femoral hernia bears the same relation to the single truss, as the double inguinal does to the single inguinal truss.

Chase's femoral truss.—“The soft iron neck of the block-attachment in this truss is bent at a right angle, so as to place the long diameter of the block in a position perpendicular when the patient stands erect. In this position, the

motions of the block-slide, which are similar to those observed in the preceding trusses (Chase's), adapt the block to the height of Poupart's ligament with great nicety; but, to meet the peculiarities of individuals in regard to the distance between the wing of the ilium and the femoral ring, another arrangement is necessary. There is a fenestrum, two inches in length, in the anterior extremity of the spring; and the soft iron neck, instead of being permanently secured to the spring, is elongated two or three inches, curved, flattened, and attached to the spring by means of two screws, which pass through the fenestrum, and, when loosened, play freely therein, so as to allow the block to approach or recede from the mesial line to any required degree. This double adjustment is simple, secure, and perfectly accurate.

“There is no other peculiarity in the spring or appendages of this truss, but the perineal strap is always secured in front to the button on the bottom of the block-side.”

The pad is constructed of such a form that it may sink beneath the edge of Poupart's ligament; and, “by pressing the soft parts directly upwards, may arrest the bowel at the edge of Gimbernat's ligament, so as to render the retention as accurate as that obtained in inguinal hernia.”

The Committee state that they have not had sufficient experience of the effects of this truss to say how far it may answer the special purpose of its construction, by entering under the fold of Poupart's ligament, and acting almost directly upon the femoral ring. The report of Dr. Chase as to its result is favourable.

Salmon's femoral truss.—The single truss for femoral hernia only embraces the affected side, and does not, like the inguinal truss, surround the sound side of the body, and extend over the pubes to the opposite groin; it is, in fact, a half of the same maker's double truss. The pad is of an oval form, and is attached by a ball-and-socket joint.

This truss is frequently worn with great comfort by patients

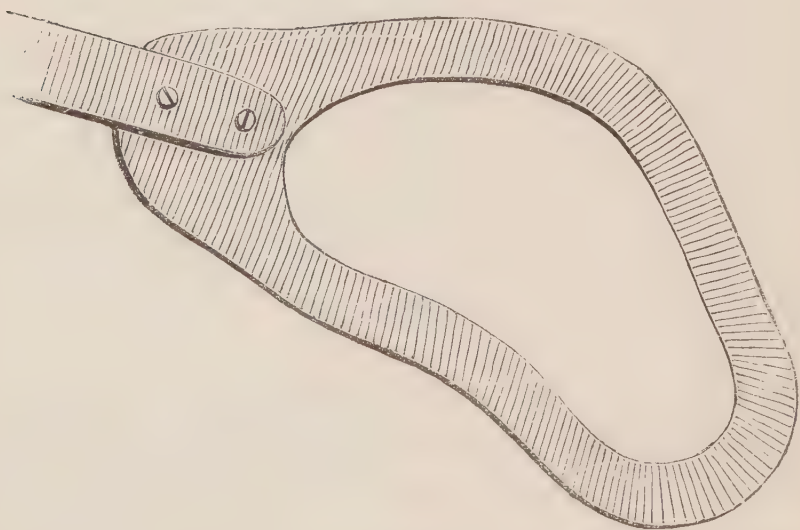
who have not experienced relief from the common spring truss; but it scarcely possesses sufficient power when the wearer has to undergo great muscular exertion.

b. Treatment of irreducible femoral hernia.—When the hernia is interstitial, the ordinary femoral trusses may be employed, but with a spring of moderate power and pad of slight convexity. The support from such a truss is often productive of great relief; and by its continued use the hernia will sometimes gradually recede into the abdomen, either from elongation of the adhesions or inversion of the sac.

If the hernia protrude externally, its future increase may be prevented, and the sufferings of the patient greatly mitigated, by the use of a truss with a hollow pad. But great care is required in the construction of such a truss; more especially when the hernia consists wholly, or in part, of intestine.

The hollow pad, which I have found most effectual, is a flat ring of metal supporting a concave metallic plate enclosed in a bag or cap of wash-leather (Fig. 56). The metallic ring

Fig. 56.



Ring of metal for the hollow pad.

should be adapted to the size and form of the particular hernia, so that it may rest upon the parts immediately sur-

rounding the tumour, without exerting any direct pressure upon it; whilst the leathern cap, spread over the opening of the ring, should possess such a degree of concavity as to enable it to support and to exert a gentle pressure upon the hernia. The metallic plate should be guarded by two or three folds of flannel covered with wash-leather.

Sir Astley Cooper observes, that, if irreducible femoral hernia be intestinal, the pressure of a truss, with a hollow pad even, cannot be borne. I am not aware of the principle upon which the hollow pads, employed by Sir Astley, were constructed; but, from the instrument which I have just described, I have frequently witnessed the most decided advantage, even in some irreducible femoral enteroceles. A male patient lately under my own care, who was the subject of an irreducible femoral hernia as large as the fist, undoubtedly an enterocele, as it was frequently the seat of rumbling sensations, experienced great relief from the use of one of these trusses, constructed by Mr. Thomas Eagland of Leeds.

c. Treatment of strangulated femoral hernia.—Femoral hernia in a state of strangulation demands the exertion of the utmost promptitude and skill on the part of the surgeon: first, in reference to the employment of the taxis, when admissible; and, secondly, in the operation for the removal of the constriction when the taxis is unavailing. In the femoral species of hernia, more than in any other, strangulation often proves rapidly destructive. No time, therefore, should be lost.

The taxis.—The question of the propriety of employing the taxis having been decided in the affirmative, the surgeon takes his station, when practicable, on the right side of the patient, who must be placed near the edge of the bed, with the shoulders elevated, the thighs bent nearly to a right angle with the trunk, the feet resting flat upon the bed, and the knees approximated, or rather the knee of the affected side inclined towards the opposite thigh.

By the adoption of this position, the resistance which the abdominal muscles would oppose to the reduction of the hernia is diminished; and, the aponeuroses of the groin and thigh being relaxed, the surgeon is enabled more efficiently to direct his pressure upon the protrusion.

When the hernia is so large as to overlie the boundaries of the saphenous opening, the surgeon, in the first instance, with the extremities of the finger and thumb of the left hand gently presses upon the tumour at its upper and iliac sides, so as to push its upper portion downwards to the level of the saphenous opening; and, retaining the fingers of the left hand in this position, he continues to oppose a barrier to the tumour, whereby it is prevented from being doubled over the sharp falciform edge of the femoral aponeurosis during the subsequent efforts at reduction. He next grasps the whole tumour with the thumb and fingers of the right hand, and, by gentle, steady, and prolonged compression, empties the distended veins of the protruded omentum of their blood, and the intestine of its contents, thereby reducing the bulk of the strangulated parts; after which he endeavours gently to push the viscera themselves into the abdomen, all violence in these proceedings being carefully avoided. If, after a reasonable time, to be judged of by the circumstances of the case, the taxis has been ineffectual in producing relief, the operation should be at once performed.

α. Operation. Preliminary considerations.—An operation for the relief of the strangulated parts being considered necessary, it is next to be determined whether the local and general symptoms justify the attempt to remove the stricture without opening the sac, or absolutely demand the exposure of the protruded viscera.

β. Operation without opening the sac.—Before commencing the operation, the surgeon should reflect upon the various structures which may possibly be the seat of stricture, in the order in which they will successively be exposed in the opera-

tion ; namely, the upper part of the femoral sheath, the femoral ring Gimbernath's ligament forming part of it, or, lastly, the sac itself, or its contents. And as it is impossible to predict with certainty, before the operation, which of these structures may constrict the hernia, he must be prepared to act in the case of any one of them forming the stricture, and even to open the sac itself, should his efforts to relieve the stricture by division of the parts external to it prove unsuccessful.

An incision, parallel to Poupart's ligament, should be first made over the middle of the tumour ; and, the integuments being tense, a second incision upwards at right angles from the middle of the former. If the first incision have been made by transfixing a fold of skin, the loose external layer of subcutaneous tissue is usually divided at the same time, leaving the deeper and more membranous layer, namely, the cribriform fascia, exposed ; and in thin subjects even the latter membrane is sometimes also divided, for in such persons the skin, the superficial layer of subcutaneous tissue, and the cribriform fascia are so adherent to each other as to be elevated together. If, however, the cribriform fascia have not been divided, its section must now be effected ; after which, the tumour presents itself covered by a tense, smooth, translucent membrane, which by persons unaccustomed to operate might be mistaken for the sac itself. This membrane is the sheath of the femoral vessels, or rather the pubic compartment of the sheath, in which, even in the thinnest subjects, a little fat may be seen in the subserous tissue. By slight touches of the scalpel an opening should now be cautiously made in the sheath ; and, a director being introduced, its more extensive division in a *vertical direction* be effected. The subserous tissue of the sac is now exposed, — a structure of very variable characters, sometimes appearing as an extremely thin layer of filamentous tissue, but scarcely ever, as has been just stated, entirely devoid of fat ; occasionally thickened so as to form a dense membrane divisible into

numerous layers, or containing enlarged lymphatic glands, and indurated masses of fat traversed by distended veins bearing a close resemblance to omentum. In reference to this structure, the operator's chief concern should be, to be able to recognize it under its various characters ; and to bear in mind, that, however altered in structure it may be, it is essentially filamentous tissue which will allow him to pass a director through it with but little resistance. Availing himself of this knowledge, he introduces a flat director upwards through this substance between the sac and the sheath, and pushes it onwards, slightly moving it from side to side, at the same time elevating the handle of the instrument so as to depress the point ; and thereby gently insinuates it behind the constricting part, which he expects or hopes to find constituted either by the upper part of the sheath of the vessels, or by the femoral ring itself. The hernia-knife is then carried along the groove of the director, and the upper part of the sheath divided as far as the edge of the femoral arch. In many cases this division of the sheath will be found to have liberated the viscera from constriction : but, if they are still retained by stricture higher up, the knife, carried along in the groove of the director, is introduced still further, until the point of resistance is passed ; when, by a slight elevation of the handle of the bistoury, its edge is pressed against the tense resisting band, and by a very moderate depth of incision the constriction will probably be removed. In this latter part of the operation the sheath is divided where it is closely adherent to, and almost incorporated with, the femoral arch ; and however slight the incision may have been, it is almost certain that some of the fibres of the femoral arch have been divided also. But, if an attempt be made to pass a director under the femoral arch before the sheath of the vessels is opened, failure will be the result, unless an unjustifiable degree of violence be used, on account of the intimate adhesion that

exists between the femoral arch and the sheath. In this manner the stricture may be removed with great facility, whether it be formed by the strong fibrous upper portion of the femoral sheath, or by the femoral arch itself; and, if it have been formed by the latter structure, it will have been as effectually liberated by the incision which we have described, as if Gimbernat's ligament had been divided.

The constriction being removed, the surgeon gently compresses the tumour so as to empty the intestine of its contents, and the gorged omentum of its blood, and then carefully replaces the protruded parts. If, however, after the division of the parts external to the sac, the viscera do not recede on moderate pressure, it may be presumed that the stricture is more deeply seated, and requires for its removal that the sac itself should be opened: and with this object it should be pinched up between the finger and thumb, and separated from the subjacent viscera; or elevated by the forceps, and opened by slight touches with the point of the scalpel held horizontally, and then more extensively divided on the director. The operator then feels for the stricture, by insinuating the tip of the finger or the director behind it; and, having detected its exact seat, he divides it with a hernia-knife to a moderate extent in a direction upwards, but inclining a little towards the umbilicus.

γ. *Operation involving the opening of the sac.*—In this operation the surgeon divides in succession the integuments, the cribriform fascia, the femoral sheath, the subserous tissue, and the hernial sac. A director on the tip of the finger is passed upwards between the sac and the protruded parts, and insinuated behind the stricture, which, whether formed by the sheath of the vessels, the femoral ring, or the sac itself, is divided upwards, and, as just stated, with a slight obliquity towards the umbilicus; this division being made to a very moderate extent only. The depth of the incision of the stricture need not in general be greater than one or two

lines; rarely a depth of three lines may be required. By limiting the extent of this incision, injury of the spermatic vessels is avoided; and at the same time, by directing it upwards instead of towards the pubes, the risk of wounding the obturator artery, when it pursues an irregular and dangerous course, is reduced to its lowest possible degree, since, when a dangerous irregularity in the course of this artery occurs, it usually approaches the mouth of the sac more nearly at its pubic than at its upper border.*

If, from the occurrence of profuse hemorrhage, which does not soon yield to compression, fear is entertained that an

* As there is a difference of opinion as to the direction in which the incision should be made, I have thought it not inappropriate to insert a valuable note on this subject which Mr. Morton has given in his excellent work on the Surgical Anatomy of the Groin.

“Sir Astley Cooper recommends the incision of the neck of the sac to be made upwards and with a slight obliquity inward, so as to divide the fascia transversalis of the posterior edge of Poupart’s ligament; Pott, Hey, Dupuytren, and Hesselbach, cut upwards; Gimbernat, Langenbeck, Scarpa, Todd, and Lawrence have found the division of the internal edge of the crural ring sufficient to remove the stricture; while Professors Cooper, Liston, Syme, and many others, cut obliquely upwards and inwards. It will be readily admitted, however, that it is not so much the direction of the incision, as its extent, that forms the essential point of practice in this part of the operation; and it is very fortunate that a slight cut of from two to three lines is usually sufficient, and sometimes a much smaller incision for the removal of the stricture, by dividing the several parts which have been regarded by these writers as the seat of the strangulation, at the same time that it does not reach any of the vessels which may perchance run over the neck of the sac.” “Mr. Guthrie states, that he has been made aware of more than one instance of the obturator artery, surrounding the neck of the sac, having been wounded in operations for strangulated femoral herniæ, which were performed by some of the best anatomists and surgeons in London, and that the patients subsequently bled at intervals until they died from hæmorrhage.—(Guthrie on Crural Hernia, 4to. p. 36.) Dr. Trusted, of Berlin, mentions a case in which the surgeon wounded the obturator artery while cutting the crural ring inwards, and the patient died eight days after the operation; six ounces of putrid blood were found in the cavity of the pelvis.—(See Cooper’s Dict. of Pract. Surg., p. 741; 7th edit.) M. Velpeau has recorded a similar case, which occurred in the

important vessel has been divided which may require ligature, the operator must introduce his finger through the ring into the abdomen, and, feeling the epigastric artery, ascertain whether itself, or any large trunk detached from it, had pursued a course towards the mouth of the sac; and, having obtained evidence that a large artery had traversed the site of the incision, he may draw down the sac and neighbouring structures, and thereby endeavour to bring the divided vessel into view; or, if unsuccessful in this attempt, he may enlarge the wound in the abdominal walls, carefully avoiding any injury of the spermatic vessels, and thereby expose and secure the divided extremities of the wounded artery.

Hospital of La Charité, Paris, in which the hemorrhage was arrested by a graduated compress, the farthest extremity of which projected into the iliac fossa: it was kept there for five days, and then removed without being followed by any return of the hemorrhage.—(Med. Opér. tom. ii. p. 489.) Mr. Hey wounded a large vessel, probably the epigastric, when cutting directly upwards, in the case of an old woman, and not on that side of the intestine which was most distant from the femoral artery. The incision was, however, half an inch in length, which is longer than is necessary. Mr. Hey found it impracticable to ligature the vessel, but placed a piece of sponge, supported by a firm compress, upon the bleeding spot, which he kept there for fourteen days, when it was removed. This case also did well.—(Pract. Obs., 2nd. edit.) Arnaud relates the case of a young man who died a few minutes after the operation for strangulated femoral hernia, in whom it was afterwards found that the artery of the spermatic cord had been divided.—(Mém. de Chirurg., tom. i. p. 758.) Sir Astley Cooper mentions a case in which the surgeon, mistaking a femoral for an inguinal hernia, cut the stricture at the crural ring, in a direction towards the ilium, and in consequence wounded the femoral vein. The venous hemorrhage was very profuse, and delayed the operation fifteen minutes, and was stopped with very great difficulty. He also mentions another case, in which the surgeon cut outwards, acting under the same mistaken impression, and narrowly escaped destroying the patient!"

Dupuytren divided the stricture upwards and outwards.—See *Leçons de Clinique Chir.*, tom. iii.

CHAPTER VII.

UMBILICAL HERNIA.

UMBILICAL hernia (*exomphalos, omphalocele*) is a protrusion of the abdominal viscera through the umbilical ring.

The umbilical aperture or ring is situated in the linea alba, and, in the foetus, transmits the umbilical arteries and vein, and the urachus. In the fetal state this opening is of considerable size, allowing the free passage of these vessels, which are united to each other and to the borders of the ring by filamentous tissue. The upper border of the ring, beneath which the vein passes, is well-defined, and is but loosely attached to the vein. The inferior border is somewhat obscured by the more close adhesion of the arteries and the urachus. The vein being large occupies nearly as much space as the two arteries and the urachus.

The peritoneum passes smoothly over the ring without exhibiting any aperture or depression. It is connected by subserous tissue to the umbilical vessels, which pursue their course to or from the ring between the peritoneum and the linea alba; the arteries and the urachus being more closely adherent to the peritoneum than the vein. In this situation scarcely any trace of the internal aponeurosis of the abdomen (fascia transversalis) can be detected. The skin of the abdomen is usually prolonged about half an inch upon the navel-string, and then terminates by a well-defined but irregular line in the dense transparent investment of the cord.

Soon after the birth of the child, the vessels contract, and

become impervious; the translucent portion of the navel-string dies, and becomes shrivelled. In a few days the dead part is detached by ulceration. The small tubular portion of skin collapses over the ring, and, in the process of cicatrization, becomes firmly united to the ligamentous remains of the umbilical vessels; and the ring for several weeks or months gradually diminishes in size, but never becomes perfectly obliterated.

1. DEVELOPEMENT AND ANATOMICAL CHARACTERS.

Umbilical hernia occurs in the foetus, in infants, and in adults, and presents some important peculiarities at these different ages.

a. In the foetus.—Protrusions of the viscera at the navel have been observed at a very early period of fetal life. Albinus²⁵⁷ has represented an umbilical hernia in an embryo less than two inches in length, and Wrisberg²⁵⁸ has recorded an instance in a foetus of ten weeks. Scarpa²⁵⁹ and Bonn²⁶⁰ have delineated similar protrusions at a more advanced period of fetal existence.

These protrusions in the foetus result from defective development of the muscles and aponeuroses of the abdomen, and their size is generally proportioned to the deficiency in the walls. They usually contain some coils of the small intestine, frequently a part of the large intestine, sometimes the liver, and occasionally the spleen.

When the protrusion involves a large portion of the abdominal viscera, the foetus generally dies before the completion of the full term of uterine life; but, if the hernia be of moderate size, the child may be born alive.

These tumours are covered in part by the common integument; but throughout the greater portion of their surface by the transparent envelope of the cord, through which the viscera may be seen. The vessels of the cord are sometimes separated by the protrusion, and occasionally they are pushed

to one side. The navel-string usually appears to be prolonged from the inferior or lateral parts of the tumour.

The viscera are invested by the peritoneum, a layer of filamentous tissue, and an external covering formed conjointly by the common integument and the transparent envelope of the cord.

b. In infants.—Hernia at the navel frequently occurs during the first few months after birth.

By the straining efforts of the child in crying, or by the injudicious use of tight bandages round the abdomen, the viscera are protruded through the umbilical ring before it has undergone its full degree of contraction.

A tumour is thus produced at the navel, of a rounded, conical, or oblong form, often resembling the inflated finger of a glove. By slight pressure the viscera may be returned ; after which, the boundaries of the ring may be distinctly felt.

According to the observations of Soemmering and Mr. Lawrence, the viscera usually protrude beneath the upper border of the ring, close to the passage of the umbilical vein.

The sac usually contains small intestine ; very rarely, if ever, omentum. The viscera are invested by the peritoneum, a layer of filamentous tissue, and the skin.

The age at which this disease most frequently occurs is stated by Desault²⁶¹ to be the second, third, and fourth months after birth.

c. In adults.—The disease, at the commencement, appears as a small rounded projection at the navel, easily reducible by pressure. In its subsequent progress its form is much influenced by the degree of obesity of the patient. If the subject of the hernia be emaciated, the tumour becomes pendulous and pyriform, and in some instances descends even lower than the pudendum ; but in persons loaded with fat the hernia spreads beneath the skin within the adipose tissue, and forms an irregular flattened tumour cognisable by the hand, but sometimes scarcely evident to the sight.

The umbilical ring is the part through which the viscera escape. It was supposed by Petit and Scarpa that the viscera rarely escaped in adults through the umbilical aperture, but generally through some portion of the linea alba in the vicinity of the navel. Sir Astley Cooper has, however, found that in most instances the viscera actually escape through the opening for the transit of the umbilical vessels. The contrary opinion, maintained by Petit and Scarpa, has evidently arisen from the cicatrix of the navel being very rarely placed at the centre of the hernia. This circumstance has, however, been satisfactorily explained by Mr. Colles, who very justly states that “the adhesion of the inflected skin to the remains of the umbilical vessels being very close, will, together with the ligamentous remains of these vessels, give greater strength to the centre of this aperture; while the space intervening between the borders of this opening and the ends of these vessels, being occupied only by cellular substance, will more readily yield to the distending cause. Hence the mouth of an umbilical hernia seldom occupies the centre of the umbilicus.”²⁶²

Gravitation exerts a considerable influence upon the progress of the tumour. Thus, whether the hernia become pyriform in shape, or insinuate itself beneath the skin, it exhibits a decided tendency to descend towards the pubes. Hence the aperture is generally situated towards the upper part of the protrusion.

The protruded viscera in the umbilical hernia of adults, as well as in this disease in infants, are enveloped by three distinct coverings,—the peritoneum, a layer of fascia, and the skin.

The peritoneum, lining the anterior portion of the abdomen, being naturally thin, becomes much attenuated when distended by a large umbilical hernia. Sometimes it yields irregularly, and exhibits a frayed appearance;²⁶³ and frequently it is dilated into small supplementary pouches. Such was probably the state of the peritoneal sac in the case related

by Sir Astley Cooper,²⁶⁴ in which strangulation occurred at an orifice in the anterior part of the general sac.

The fascia which covers an umbilical hernia may be regarded anatomically as compounded of the subserous and subcutaneous tissues.

The external investment of the hernia, which is formed by the skin, varies considerably in thickness, if the protrusion be large, in different parts of the tumour. Thus, that portion of skin which originally closed the umbilical opening becomes extremely thin under distension, and is intimately united with the fascia and the peritoneum, so that during the operation for strangulated umbilical hernia they are generally divided together, as if they were one membrane; but when the tumour is large, more especially if it have insinuated itself into the adipose substance, the skin, beyond the boundaries of that portion in which the umbilical cicatrix is situated, retains its ordinary thickness, and is often separated from the deeper layer of subcutaneous tissue or fascia by a considerable quantity of fat.

The thin portion of skin covering the anterior part of large umbilical herniæ is sometimes the seat of indolent ulcers, which are extremely difficult to heal.

The umbilical herniæ of adults usually contain omentum; frequently also intestine, more especially the colon; and very rarely small intestine alone. Mr. Lawrence operated in a case in which several coils of intestine only were protruded. Dr. Davis observed a remarkable umbilical hernia in a female who had borne many children. When in labour of her second child, a hernia occurred at the navel, which gradually increased at each succeeding pregnancy, until at length the impregnated uterus made its way completely out of the abdomen, and became suspended over the pubes. Dr. Davis saw her at the expiration of the ninth month of her twelfth pregnancy.

Occasionally two umbilical herniæ are observed in the same subject. A case of this description is related by Sir A. Cooper.

Flatulence, nausea, pain, and other distressing dyspeptic symptoms more frequently attend umbilical than other species of hernia.

2. CONDITIONS OF UMBILICAL HERNIÆ.

Umbilical herniæ in adults have a great tendency to become irreducible, from adhesions, or from growth of the protruded parts. When they are irreducible, obstruction from fecal accumulation, if the large intestine be the part protruded, may occur. The parts are constantly liable to injury from blows or falls. But the evil of most frequent occurrence, if we except strangulation, is inflammation of the hernia, which gives rise to swelling and pain in the part, and may ultimately produce strangulation.

In the strangulated condition of umbilical hernia, the aponeurotic opening is the usual seat of stricture. The neck of the sac may sometimes constrict the viscera, but this structure is less frequently the seat of stricture in umbilical than in other herniæ. The orifice of a supplementary pouch may also be the occasional seat of stricture.

3. STATISTICS AND CAUSES.

The following table from M. Malgaigne, although including some other herniæ of the linea alba, may be regarded as offering a tolerably correct view of the relative frequency of umbilical herniæ in the two sexes at different ages.

Table of patients affected with herniæ at the navel and linea alba, examined at the Bureau Central in 1836:

							Males.	Females.
From birth to 6 years	.	.	.	.	.	.	22	3
From 6 to 13 „	.	.	.	.	.	.	3	5
„ 13 to 20 „	.	.	.	.	.	.	1	4
„ 20 to 30 „	.	.	.	.	.	.	5	4
„ 30 to 40 „	.	.	.	.	.	.	7	21
„ 40 to 50 „	.	.	.	.	.	.	19	24
„ 50 to 60 „	.	.	.	.	.	.	13	24
„ 60 to 70 „	.	.	.	.	.	.	12	12
„ 70 to 80 „	.	.	.	.	.	.	4	11

From this table it appears, that, of 194 umbilical herniæ, 86 occurred in males, and 108 in females.

It is further shewn that the umbilical herniæ of infancy and early childhood preponderate in a very marked degree in the male sex, whilst in females the herniæ of adult age are the most numerous.

Large size of the aponeurotic opening of the navel must be considered as the great predisposing cause of umbilical hernia. When this opening is preternaturally large, from defective developement of the abdominal muscles and their aponeuroses, the fetal form of the disease occurs. The comparatively large size of the opening for some weeks and months after birth, favours the production of the disease in infants. The dilatation of the opening in adults, in conjunction with general distension of the abdominal muscles from pregnancy, obesity, ascites, and other causes, tends to the production of umbilical hernia in adults.

The exciting causes are those which produce herniæ in general. Of these, the violent straining of infants in the act of crying appears to operate especially in producing the umbilical herniæ of infancy.

It is difficult to explain the greater frequency of the disease in male than in female infants. Whether, as surmised by M. Malgaigne, the muscular efforts of boys in crying are greater than in girls, or their umbilical vessels are larger, and consequently require a larger aperture, we are unable at present to determine.

4. TREATMENT OF UMBILICAL HERNIA.

a. Reducible umbilical hernia. Radical cure.—A permanent cure of umbilical hernia originating in the fetal state has in a few instances been obtained.

Dr. Hamilton, formerly Professor of Midwifery in Edinburgh, communicated the following case to Sir Astley Cooper. The tumour was about the size of a hen's egg, and the

deficient space in the abdominal walls through which it had escaped was as large as a half-crown piece. After the viscera had been replaced, a ligature was tied round the base of the sac, and the separated walls of the abdomen were closely united by two silver pins, and some adhesive straps. In a few days the cure was complete.

Mr. Hey adopted a plan of treatment equally successful, but less likely to be productive of danger. In a case in which the tumour was of the size of a hen's egg, Mr. Hey replaced the viscera, and, having laid one of the lips of the aperture a little over the other, retained them in this position by a conical compress, formed of circular pieces of plaster spread on leather, and a linen belt. The funis separated about a week after birth; and, in a fortnight afterwards, the aperture at the navel was so much contracted, that the crying of the child, when the bandage was removed, did not cause the least protrusion. The use of the bandage was continued for some time afterwards.

When the protrusion is so large as to involve the greater portion of the intestinal canal, a fatal result is almost inevitable.²⁶⁵

In treating the umbilical herniæ of *infants*, it should be remembered that the aponeurotic opening has a natural tendency to contract for many months after birth. This contraction of the aperture is in some instances sufficient to effect a spontaneous cure. A child two years old, with a hernia as large as a nut, was brought to Desault, who proposed to treat the disease by ligature, but was unable to obtain the consent of the parents. In the following year, when the child was again seen by Desault, the tumour had entirely disappeared, although no treatment had been adopted. The experience of most surgeons can supply similar evidence of the occasional spontaneous cure of umbilical hernia in infants.

But such a result is not so frequent or general as to justify

the surgeon leaving the case to the unaided efforts of nature. It is his duty to employ mechanical means for the retention of the hernia; and, if such treatment be efficiently adopted during the first or second year of infancy, the umbilical aperture may in most instances be expected to contract sufficiently to secure the permanent retention of the viscera.

The means best adapted to the retention of the hernia in infants are solid compresses, maintained in their situation by adhesive plasters or bandages. In very slight cases, a strap of adhesive plaster placed across the abdomen is sufficient for the purpose, but in most instances a solid compress is required. This may be constructed of ivory or of wood, of an hemispherical form, and from half an inch to an inch in diameter. Another convenient form of compress consists of a flat disc of wood or ivory with a mammillary projection in its centre. These may be retained in their situation by a piece of leather spread with adhesive plaster, supported by a linen belt; or, as recommended by M. Malgaigne, by a long strap of adhesive plaster which passes two and a half times round the abdomen.

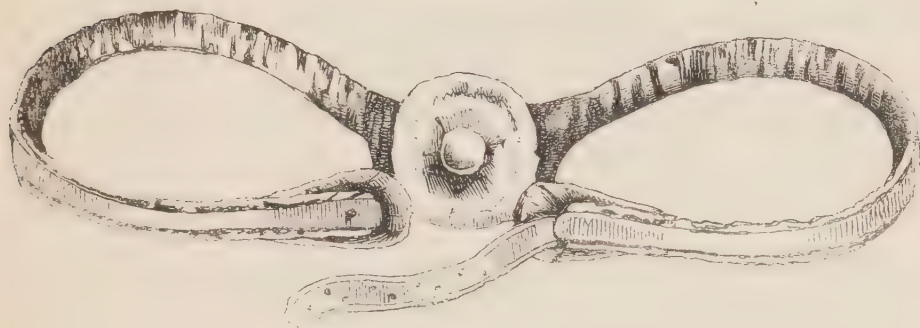
The result of this mode of treatment, when steadily pursued for a few weeks or months, is generally successful, if practised during the first two or three years after birth. At a subsequent period, permanent cure is less frequent; and, if the treatment be delayed until adult age, a cure is rarely, if ever, effected.

The treatment by ligature practised by Desault, referred to in a former chapter, is now universally discarded.

Palliative treatment of reducible umbilical hernia.—As a permanent cure of this disease is not to be expected in adults, the surgeon may yet relieve the unpleasant feelings which would result from an umbilical hernia being unsupported, and may diminish the risk of the hernia becoming irreducible or strangulated, by the use of retentive bandages or trusses. Some of those which the author considers the most efficient, will now be described.

Eagland's truss.—Mr. Hey, in the third edition of his “Practical Observations,” described a truss for umbilical hernia, invented by Mr. Eagland of Leeds, which was more successful than any other which he had employed. After the lapse of many years, this instrument still merits the high commendation bestowed upon it by Mr. Hey. (See figs. 57

Fig. 57.



Eagland's Umbilical Girdle.

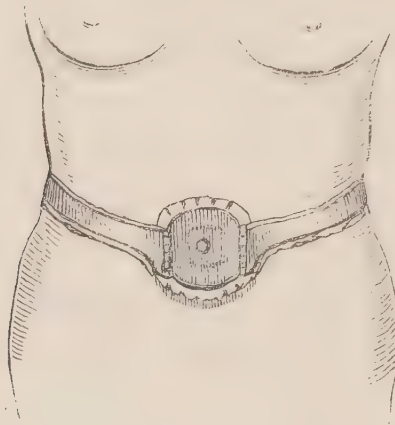
and 58.) It consists of two springs, formed nearly in the shape of a horse-shoe, each of which is fastened by a hinge at its anterior extremity to a small plate of flat steel, to which is attached a convex compress formed of cork, and covered with a few layers of flannel, and an outer layer of wash-leather. This pad, when applied, adapts itself closely to the umbilical region; and the regular and constant pressure of the springs prevents the hernia from protruding, without giving uneasiness to the patient.

Malgaigne's truss.—Under this designation may be noticed the pad of a mushroom form, detached from the spring, which has already been described in connexion with direct inguinal hernia. M. Malgaigne has successfully employed this pad, retained in its position by a common spring which rather more than half encircles the body.

Chase's truss.—The pad of this truss has a central prominence on its convex surface. The pad, “with its brass rider, is

attached to a circular expansion on the anterior extremity of the soft iron neck, by means of two screws; one placed vertically about an inch above the other, and so formed as to

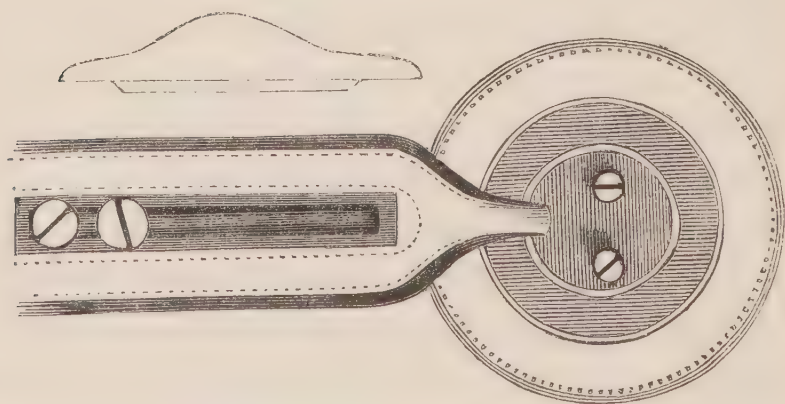
Fig. 58.



Eagland's Umbilical Girdle applied.

serve at the same time as buttons, on which the strap is secured by means of a double series of eyelet holes." "The spring is placed horizontally. Its anterior extremity is provided with a fenestrum five inches in length. The soft iron neck is about six inches long, and is secured to the spring by two screws which pass through the fenestrum, and may be

Fig. 59.



Chase's Umbilical Truss.

made to slide therein precisely as those do which are seen in the corresponding part of the femoral truss." The back-pad

is of oblong form, six inches long, arched transversely, and supported by two leather loops.

The three trusses already noticed are adapted to the generality of reducible umbilical herniæ; but cases are sometimes seen, in which, from a variety of circumstances, these instruments are ineffectual, or are productive of such inconvenience as to render their employment inadmissible. When, for instance, there is a very lax and pendulous state of the abdomen, the pad should be attached to a broad plate of steel of very moderate concavity. In cases of extreme obesity, and during pregnancy, the circular constriction of the ordinary trusses is sometimes insupportable. In such cases the ivory compress retained by adhesive plaster, as recommended in the treatment of this disease in infants, may be employed.

b. Treatment of irreducible umbilical herniæ. — When the hernia is irreducible and of moderate size, Eagland's truss, with a hollow pad constructed upon the same principle as that recommended for irreducible femoral hernia, affords great relief to the patient.

When the hernia is of very great magnitude, it may be supported by a sling adapted to the size and form of the tumour, and suspended from the shoulders.

Few cases demand a greater exercise of judgment on the part of the surgeon, than those of *irreducible umbilical hernia in a state of inflammation*. The symptoms resulting from this combination of evils closely resemble those of strangulation, and the disease may ultimately be complicated with strangulation. Thus, whilst the surgeon must be on his guard against the unnecessary performance of an operation of appalling fatality, he must be equally vigilant in recognizing the occurrence of such symptoms as demand the intervention of the knife.

The symptoms indicating inflamed irreducible hernia have already been considered, as well as the treatment generally applicable to this state of hernia. It may here be briefly

stated that the treatment consists in the judicious use of general and local blood-letting, of cold or of emollient applications, and of aperient clysters. If these remedies fail to give relief, and the symptoms are such as lead to the presumption that the protruded and inflamed parts have become so much swollen as to suffer constriction from the ring or the neck of the sac, it is the duty of the surgeon to liberate the parts from stricture.

c. Treatment of strangulated umbilical hernia. Taxis.—Before an attempt is made to replace an umbilical hernia by manual pressure, the abdominal muscles must be relaxed. For this purpose the shoulders and pelvis are to be raised, whilst the back is allowed to sink; and the thighs placed at a right angle with the trunk. The surgeon then supports the upper part of the tumour with the fingers and thumb of the left hand, whilst with the right he compresses it, endeavouring to empty the protruded intestine of its contents and the gorged vessels of the omentum of their blood, and afterwards to push the protruded parts into the abdomen, directing the pressure upwards towards the aperture through which the viscera have escaped.

Operation.—The great fatality of operations for umbilical hernia, when the sac has been opened, renders it especially important in this species of hernia to preserve the sac entire, unless circumstances exist which imperatively demand an opposite course of proceeding.

This operation may be performed in the following manner. A vertical incision from two to three inches in length is made over the linea alba and upper part of the tumour, the surgeon bearing in mind the extreme tenuity of the coverings of the hernia. Having by this incision exposed the linea alba for about an inch in extent above the hernia, he perforates this tendinous expansion (Key), and introduces the director behind it, gently insinuating the instrument downwards as far as the edge of the umbilical aperture; the resisting band

is then divided downwards upon the director. Whilst these pages were passing through the press, a case of umbilical enterocoele, long irreducible from adhesions, became strangulated and fell under the care of the author. After the linea alba had been divided a little above the hernia, the left fore-finger was introduced into the opening in the tendon, and being passed downwards below the constricting band, its tip was gently pushed forwards into the umbilical tumour, being insinuated between the sac and the external envelopes. By a probe-pointed bistoury, conducted along the finger, the whole of the resisting fibrous structure was divided, and the viscera were released from constriction. The protruded intestine, from being adherent to the sac, did not admit of replacement; but its contents, after the operation, could by moderate pressure be readily made to pass to and from the abdomen. The operation was performed in a few minutes without difficulty. During the night the bowels of the patient were freely evacuated, and she had subsequently a very favourable recovery.

If the division of the ring is not sufficient to release the protruded parts, a small opening must be made in the upper part of the sac, and its neck divided; great care being taken to avoid wounding the intestine, which is often adherent. If there is reason to suspect a gangrenous state of the hernia, the sac must be freely opened, and the viscera treated upon the general principles applicable to such a condition.

It was remarked by Sir Astley Cooper, that pregnancy does not add much to the risk of the operation, when the constitution of the patient is otherwise good. He relates a case in which the operation was successfully performed during the fifth month of utero-gestation. Mr. Lawrence operated with a favourable result during the seventh or eighth month, and Mr. Clement at the fourth month.

CHAPTER VIII.

VENTRAL HERNIA.

THOSE herniæ which protrude through the anterior or lateral walls of the abdomen, without traversing the umbilical, abdominal, or femoral rings, are named *Ventral*.

Ventral herniæ may occur in any part of these walls, but their most frequent site is the upper half of the linea alba. They are found either immediately above the umbilicus, or between the umbilicus and the ensiform cartilage, or at the side of the ensiform cartilage. They have usually a flattened form, and seldom attain so large a size as umbilical herniæ. Those which protrude at the side of the ensiform cartilage are generally small, and on this account have frequently been overlooked. The herniæ at the upper part of the linea alba, from being frequently attended with more distressing dyspeptic symptoms than other herniæ, were supposed by Garengéot and the younger Pipelet to be actual protrusions of the stomach; but it does not appear that in any instance their opinion was founded on dissection: whereas a hernia of the linea alba a little above the navel, which was attended with the same symptoms of gastric disturbance, was found by M. de la Peyronie²⁶⁶ to contain only the colon and omentum; and M. Littré²⁶⁷ dissected a hernia situated three fingers' breadth below the navel, formed by a protrusion of the colon. We are therefore not justified, from the symptoms of gastric derangement alone, to infer that herniæ at the upper part of the linea alba are protrusions of the stomach. The connexion existing between the colon and the stomach suffi-

ciently explains the disturbance of the functions of the latter.

Scarpa accounts for the greater frequency of hernia at the upper than at the lower part of the linea alba, on the supposition that it is naturally weaker, and that it yields more than the inferior portion to distension during pregnancy. He remarks, "If, in those who have had many children, we carefully examine the superior portion of this aponeurosis, and place it opposite to the light, it is found to be irregular, thin in some places, and transparent, in others wasted, and disposed to separate longitudinally or transversely."²⁶⁸ So great is this tendency of the superior part of the linea alba to separate in some subjects, that as many as three herniæ have been observed between the navel and ensiform cartilage.

The aperture is generally of an oval form, its direction varying in different herniæ.

The sac of a hernia of the linea alba is invested by a layer of subserous tissue containing fat, by the superficial fascia, and the skin.

Herniæ of the linea semilunaris are usually situated below the level of the navel. They exhibit some variety in their coverings. Occasionally they completely traverse this compound tendinous line; in which case, the sac is merely covered by the subserous tissue with an intermixture of fibres of the internal aponeurosis (fascia transversalis), the superficial fascia, and skin: but if the hernia be situated towards the iliac border of the linea semilunaris, as in a case²⁶⁹ which required operation at the Leeds Infirmary, it receives also an investment from the aponeurosis of the external oblique.

Various cases have been recorded of herniæ in the hypochondriac regions, and in the space between the lower ribs and the crest of the ilium.²⁷⁰

M. Cloquet²⁷¹ has minutely described a hernia in the lumbar region.

a. The *causes* which usually predispose to the occurrence

of ventral hernia are,—congenital defect in the development of the abdominal muscles and their tendinous expansions; pregnancy, which operates more especially in stretching and weakening the upper part of the linea alba; blows, whereby the abdominal muscles or their aponeuroses are lacerated; and penetrating wounds of the abdomen. A patient was admitted into the Leeds Infirmary under my care, who had received a violent blow with a piece of iron on the abdomen, between the navel and the spine of the ilium. As soon as the ecchymosis had disappeared, the site of the contusion was found to be occupied by a flattened hernial tumour in a reducible state. Information was received that this man died some months afterwards, whilst suffering from intestinal obstruction. Simon²⁷² has related several cases in which the Cesarian operation was followed by hernia in the vicinity of the cicatrix.

Fatty tumours, bearing a close resemblance to herniæ, occasionally protrude through the linea alba. Several of these tumours sometimes occur in the same subject. They consist of packets of fat belonging to the subserous tissue, which, having been protruded through apertures in the linea alba, have become subsequently enlarged and indurated. On dissection they are found to be devoid of peritoneal sac, and connected by a narrow neck, which may be traced through the aperture to the filamentous tissue external to the peritoneum.

These tumours, in their external characters, closely resemble irreducible herniæ; and, when they are accompanied with the symptoms of intestinal obstruction, they may be readily mistaken for herniæ. Scarpa, indeed, acknowledges having committed this error. As, however, no serious injury is likely to result from exposing and removing such tumours by the knife, it is better in all doubtful cases to expose the part by incision.

b. Treatment.—Ventral herniæ, in a reducible state, and

situated in the linea alba, may generally be retained by Eagland's umbilical truss. When, on account of pregnancy or great obesity, this truss cannot be worn, the hemispherical or nipple-shaped compress of ivory, retained by adhesive plaster, may be employed.

Those herniæ which protrude at the side of the ensiform cartilage are sometimes very difficult of retention. In such cases the pad should be adapted to the angular hollow of the epigastrium, and care should be taken that it do not rest upon the edges of the ribs.

Ventral herniæ at the lower and lateral parts of the abdomen may be supported by modified forms of the common spring-truss for inguinal herniæ; the anterior extremity of the spring and the pad being directed horizontally or upwards, as the case may require.

In the irreducible state, the hollow pad is required.

When ventral herniæ become strangulated, and require operation, it must be remembered that the investments are subject to variety; some of these herniæ being covered by the aponeurosis of the external oblique, whilst others are devoid of this investment. The section of the envelopes must of course be effected with regard to these varieties. The stricture is usually, perhaps invariably, formed by the opening in the muscles or their tendinous expansions, and may be divided in any direction which is most convenient, except in those herniæ which are situated near the epigastric artery. In such cases the judgement of the surgeon will enable him to select the proper line of incision. It is important, whenever practicable, or the case is favourable for it, to avoid opening the sac.

Very few operations for strangulated ventral hernia have been recorded, and in these the termination was generally fatal.

Sir Astley Cooper has related two cases of ventral herniæ, in which the operation was performed. Both of these cases proved fatal. A man, aged 69, was admitted into the Leeds

Infirmary under my care, June 1, 1842,²⁷³ labouring under symptoms of obstruction of the bowels. A flattened tumour, hard, unyielding, and painful under pressure, was discovered on the left side of the abdomen, midway between the navel and the spine of the ilium. The taxis proving ineffectual, I made an incision two inches and a half long, over the tumour in the direction of its long axis, which corresponded with the course of the fibres of the external oblique muscle. By this incision the aponeurosis of the external oblique was exposed tightly extended over the tumour. The aponeurosis being divided, a thick layer of filamentous tissue covering the sac presented itself. On opening the sac, a coil of large intestine, of a high degree of vascularity, and a portion of omentum, were exposed. The fore-finger being now passed deep into the sac, the viscera were found to be constricted by an aperture, fleshy at its iliac border, but sharp and tendinous at its mesial side, which corresponded with the linea semilunaris. The stricture being divided upwards, the intestine was replaced; but the omentum, which was extensively adherent, was allowed to remain in the sac. In half an hour after the operation the patient had a copious fecal evacuation, and the abdomen became softer, but severe pain continued. He died twelve hours after the operation. On dissection, the colon above the strictured part was found intensely inflamed.

CHAPTER IX.

OBTURATOR HERNIA.

OBTURATOR hernia is a protrusion of the viscera through the opening which transmits the obturator vessels.

The father of the celebrated Arnaud was the first surgeon who recognized this form of hernia. Since his time it has, on several occasions, been observed in the dead body. Sir Astley Cooper, who has dissected and delineated a case of obturator hernia, thus describes the protrusion, which was of the size of a nutmeg: "It descended through the aperture in the ligament of the foramen thyroideum, above the two obturatores muscles. The os pubis was placed immediately before the neck of the sac. Three-fourths of it was surrounded by the ligament of the foramen. The fundus of the sac was placed under the heads of the pectineus and adductor brevis muscles." 274

We do not possess any records of cases of this form of hernia, in which the dissection had been minutely conducted; but it may be presumed, from analogy, that the hernia would enter the delicate tubular sheath which the obturator vessels derive from the internal aponeurosis of the pelvis, and consequently that the hernial sac would receive a covering, however delicate, from the obturator sheath. More externally it is covered by the pectineus and triceps muscles, the pubic portion of the femoral aponeurosis, the superficial fascia, and the skin.

In the case described by Sir Astley Cooper, as well as in

one dissected by M. Cloquet, and another by Mr. Lawrence, the vessels pursued their course beneath the tumour. This may be considered as the usual relative position of the vessels under their normal distribution; but, when the obturator artery is derived from the epigastric or the external iliac, its course will probably be above the hernia.

Although obturator hernia has frequently been observed in the dead body, yet it is doubtful whether it has ever been detected in the living subject. Arnaud imagined that he had frequently recognized and reduced this hernia, but his cases have not been recorded. Garengéot²⁷⁵ reduced by the taxis a hernia, which he has described as being a protrusion at the obturator opening. In this case there was a tumour, painful on pressure, at the superior and pubic part of the thigh, forming a prominence as high as two fingers' breadth, and extending half-way down the thigh. The tumour receded on pressure with a gurgling noise. There is no evidence in this case to shew that it was not a femoral hernia. Malaval²⁷⁶ was consulted about a round irregular tumour at the upper and pubic part of the left thigh. By the taxis a portion of intestine receded with a gurgling noise, but some omentum remained in the sac. After a few days, by an incision "through the skin and fat," the hernial sac was exposed, and, after it was opened, a portion of omentum as large as a nut was excised. In the history of this case, as detailed in the *Mémoires de l'Académie Royale de Chirurgie*, there does not appear to be any decisive evidence that the hernia was any other than femoral. It may moreover be observed that the operation for the removal of the omentum was not only an unnecessary but a dangerous proceeding in this case. In another case, reduced by the taxis, Garengéot speaks of a tumour being situated in the right thigh, near the perineum. Now, the existence of a well-marked external tumour may be regarded as presumptive evidence that the hernia was not of the obturator species; for, in all the recorded instances in which

the existence of the disease has been verified by dissection, there was not any visible external tumour. Thus, in a subject examined by Duverney,²⁷⁷ who had an obturator hernia as large as a hen's egg on both sides of the body, there was not any external swelling. A hernia of similar size, dissected by Heuermann,²⁷⁸ was unattended with any outward tumefaction. Nor was there any external swelling in Cloquet's²⁷⁹ case.

An obturator hernia usually consists of a protrusion of the small intestines; but, in the case examined by M. Cloquet, omentum as well as intestine had been protruded.

The disease is supposed to be more frequent in women than in men. Of twelve recorded instances of obturator hernia, in which its existence was proved by dissection, eight occurred in females, and four in males.

From the deep-seated position of this hernia, and from the dense covering which it derives from aponeurosis and muscle, its detection in the living body must necessarily be difficult. But nevertheless it may sometimes be possible to obtain fair presumptive evidence of its existence. Whenever there are symptoms of strangulation, and no tumour can be detected in the ordinary sites of hernia, the surgeon ought to examine carefully the obturator region, and although no tumour in that situation may be visible, yet by the touch he may perhaps be able to detect a deep-seated tumefaction, accompanied with tension and pain on pressure,—phenomena rendered more obvious by comparing, in these respects, the suspected with the opposite side.

Should the surgeon succeed in recognizing the existence of a strangulated obturator hernia, he may perhaps by relaxation of the muscles, and well-directed pressure, effect its reduction. The truss which we have already recommended for femoral hernia, but furnished with a more prominent pad, would be calculated to support such a hernia. (See p. 326.)

Should the taxis fail, we can imagine the occurrence of a case in which the evidence of the existence of an obturator

hernia, in a strangulated state, was sufficiently decisive to justify the performance of an operation for the removal of the stricture. In this case, a longitudinal incision should be made parallel to the pubic side of the femoral sheath, and as near to it as could be done with safety. As a general rule, the situation of the femoral artery must be ascertained by its pulsation ; and the incision made parallel with, and about an inch distant from it, on its pubic side. The pubic portion of the femoral aponeurosis being divided in the same direction, the separation of the muscular fibres might be effected by a director, or the handle of a scalpel, until the tumour covered by the obturator sheath was exposed. This membrane and the sac being divided, the stricture should be removed by a minute incision directed transversely towards the pubes.

CHAPTER X.

ISCHIATIC HERNIA.

THE abdominal and pelvic viscera have, in a few instances, been known to protrude at the ischiatic notch.

Sir Astley Cooper had the opportunity of dissecting a hernia of this species, in conjunction with Dr. Jones. The patient died, after suffering seven days from strangulation. No hernia could be detected in the ordinary sites of this disease, and its actual seat was not discovered until it was revealed by dissection. In relating the case, Dr. Jones observes, "Upon a careful dissection of the parts after they had been brought to my house, we found a small orifice in the side of the pelvis, anterior to, and a little above, the sciatic nerve, and on the fore part of the pyriformis muscle. When the finger was passed into this opening, it entered a bag situated under the glutæus maximus muscle; and this was the hernial sac, in which a portion of intestine had been strangulated. The cellular membrane, which connects the sciatic nerve to the surrounding parts of the ischiatic notch, had yielded to the pressure of the peritoneum and viscera. The orifice of the hernial sac was placed anterior to the internal iliac artery and vein, below the obturator artery, and above the obturator vein; its neck was situated anteriorly to the sciatic nerve; and its fundus, which was on the outer side of the pelvis, was covered by the glutæus maximus. Anterior to, and a little below, the fundus of the sac, was situated the sciatic nerve; behind it, the gluteal artery. Above, it was placed near to the bone; and below, appeared the muscles and ligaments of the pelvis." ²⁸⁰

Ischiatic herniæ have probably never yet been recognized in the living body. It is true that several herniæ of large size have been described as protrusions at the ischiatic notch, but it is highly probable that their real character had been misunderstood. In reference to one of these cases, in which a tumour appeared at the right side of the anus, and gradually increased so as to form an immense pendulous bag, described in Papen's "*Epistola de stupendâ Herniâ dorsali*," Mr. Lawrence observes, "The opening, at which the parts protruded, is by no means clearly described. The circumstance of the swelling having been perceptible when small, of its situation near the anus, and of its increase to so great bulk, make me doubt whether the parts had passed out at the sacro-sciatic foramen."

The small intestine was the part protruded in Dr. Jones's case, and in two instances recorded by Bertrandi.²⁸¹ Camper²⁸² observed the ovary protruded at the ischiatic notch.

In reference to the treatment of this form of hernia, Sir A. Cooper observes, "If this hernia should, in any case, be obvious to the feel, and should be found reducible, a spring-truss might be easily constructed to keep it within the pelvis. If it has become strangulated, and an operation is ventured upon, the safest direction in which the orifice of the sac can be dilated, will be directly forwards."

CHAPTER XI.

PERINEAL HERNIA.

THOSE herniæ which occur at the lower aperture of the pelvis are either perineal, vaginal, or pudendal, according as they severally present themselves, whether at the perineum, vagina, or labium pudendi.

They may all be regarded as varieties of the same species of hernia, which consists essentially in a protrusion through that portion of the internal aponeurosis of the abdomen and pelvis, which, passing from the sides of the pelvis over the inner surface of the levator ani to the rectum, vagina, and neck of the bladder, assists in supporting these organs in their proper position, and in its normal state prevents the moveable viscera from escaping through the outlet of the pelvis.

Perineal hernia.—The herniæ which occur at the perineum present some varieties in their course. Occasionally the hernia occupies a central position, the sac being a prolongation, in the median line, of the pouch of peritoneum which exists between the rectum and urinary bladder in the male, and between the rectum and vagina in the female. Sir Astley Cooper dissected a hernia of this description in the male subject. The hernia had descended to the perineum, but did not form an external tumour. The base of the hernial sac was placed before the anus, and behind the prostate; the body of the vesiculæ seminales on the sides of the sac, and the apex of the vesicles in front. The mouth of the sac was two and a half inches above the anus. Occasionally the

hernia produces an evident tumour in the perineum, which, in a case related by Jacobson,²⁸³ was as large as a hen's egg. Perineal herniæ have also been seen in the female in front of the anus. Dr. Haighton saw a tumour of this kind which descended between the vagina and rectum. When pressed upon from the vagina, it protruded the rectum. If compressed from the rectum, it forced the vagina through the os externum. In a case related by Mery, the tumour between the anus and os externum was as large as a hen's egg.

More frequently the hernia descends laterally to the perineum, and forms a tumour, more or less prominent, at the side of the anus. Scarpa has related a case, in which a hernia appeared at the right side of the anus in the male subject, in consequence of exertion. Soon after its occurrence it was of the size of a pigeon's egg; but after some years it became as large as a hen's egg, and assumed a pyriform shape. On one occasion it became strangulated, but relief was soon obtained by fomentations and clysters. The patient died of a pulmonary affection. The ileum passed into a hernial sac, of which the orifice, near an inch in diameter and round, was situated at the right side of the rectum and bladder; and it was protruded in the interval between the right side of the anus, the tuberosity of the ischium, and the point of the coccyx. After removing the skin, a thin stratum of fibres of the levator ani, separated from each other, was found to cover the hernial tumour; and, on turning this aside, the hernial sac was exposed. Its mouth was not within the pelvis, but lower, and exactly in the perineum; thus it appears that this part is originally higher, and within the pelvis, but that it gradually descends. Many instances of lateral descent in the perineum in the female have been recorded by Schreger, Verdier, Jacobson, and Smellie.

The contents of perineal herniæ are usually the small intestine or the urinary bladder. The latter organ appears to form the protrusion as frequently as the intestine. Pipelet

has recorded a case of perineal hernia, in which he supposes the bladder to have been protruded; but his description of the case does not afford satisfactory evidence of the nature of the protrusion. A well-marked case of perineal cystocele in the male is however related by Jacobson. The patient had received a blow on the perineum, from falling with the legs astride of a ladder. An oval swelling of the size of a walnut subsequently formed between the anus and scrotum, rather towards the left side: he was obliged to press the swelling during micturition. The case of Mery, to which allusion has here been made, was a perineal cystocele in the female. Verdier and Jacobson have recorded other instances.

These affections admit of considerable relief from bandages and trusses. A circular metallic belt to surround the pelvis, with a spring attached to it at right angles, supporting a pad of the requisite size and form, constitutes an efficient truss for perineal hernia. The T-bandage, and the ordinary bandage worn by females, have also been used with considerable benefit.

CHAPTER XII.

VAGINAL HERNIA.

WHEN the walls of the vagina are much relaxed from frequent parturition or other causes, the hernia, instead of descending into the perineum, protrudes at the vagina. Sir A. Cooper describes a case of vaginal hernia, in which a tumour, the size of a small billiard-ball, was situated at the posterior part of the vagina, a little inclined to the left side. It was elastic, and not painful to the touch; receding on pressure, and reproduced on coughing. In a case observed by Dr. Sims, solid fæces could be detected in the tumour, which was covered by the posterior wall of the vagina. Sandifort has recorded an instance in which the posterior wall of the vagina was protruded through the os externum.

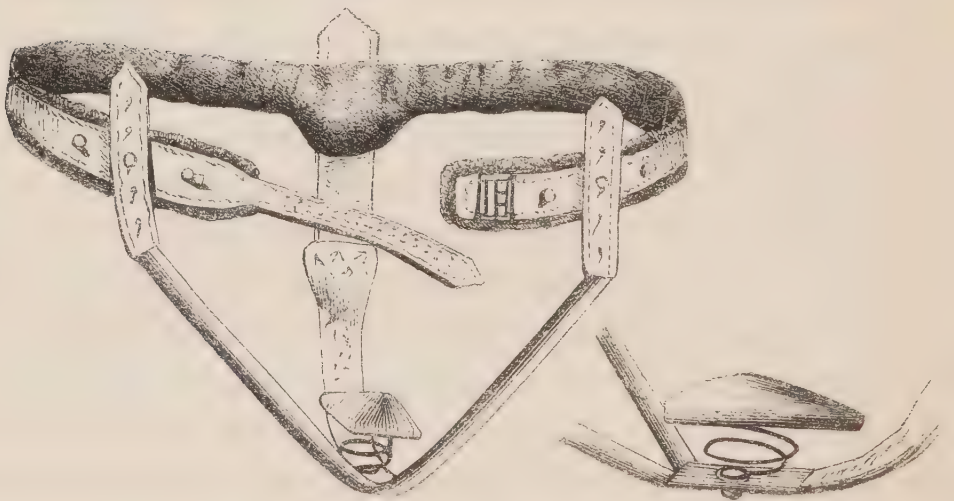
The cases of hernial protrusion at the posterior wall of the vagina appear generally to have been protrusions of the intestine; but, in protrusions occurring at the anterior wall, the bladder is the part almost invariably displaced. The following interesting case of entero-vaginal hernia, recorded by Dr. Davis in his *Principles of Obstetric Medicine*, merits attention. “A young married woman, having fallen a considerable height, felt pain within the pelvis, which she referred more particularly to the bladder as being its seat. On examination, an intumescence of such magnitude as very nearly to fill the upper and middle part of the vagina, was found to proceed from the very termination of the vagina superiorly, immediately between that part and the anterior lip of the uterus. There was frequent vomiting, and the swelling was exceed-

ingly tense and painful. The catheter was introduced without relief; after which, the left hand was by slow degrees introduced within the vagina. Cautious and gradual pressure was made upon the tumour, which was reduced in about a quarter of an hour; a gurgling noise accompanying its return. The mucous membrane of the vagina had not been ruptured, but formed an investing coat to the hernia. A large pessary was afterwards introduced. Severe inflammatory symptoms followed the accident, but the patient ultimately recovered; and, when the parts were free from pain, a very light, hollow, perforated wooden pessary, of nearly cordiform shape, was substituted for the sponge. After a few months the pessary was discontinued, and the woman cured." In this affection a tumour is felt occupying the vagina, or even protruding through the os externum, which is removed by pressure alone, or aided by the use of the catheter. Behind these protrusions the os uteri is felt in its natural situation. Such tumours have occasionally impeded parturition. It is very doubtful, however, whether any of the cases recorded as *herniæ* protruding the anterior wall of the vagina, are in reality true *herniæ*; or, in other words, whether they actually protrude through the pelvic aponeurosis. Most, if not all, of the recorded instances of this affection are simply a falling down of the bladder from general relaxation of the anterior wall of the vagina and its supporting structures, similar to those so ably described by Mr. Robertson.²⁸⁴

Herniæ occurring at the posterior wall of the vagina, as well as the falling down of the anterior wall, admit of considerable relief from pessaries of various forms, more especially from those constructed as a hollow cylinder. The protrusions of the anterior wall are relieved by the same means, aided occasionally by the catheter. In these protrusions, which occur soon after parturition, Dr. Robertson enjoins recumbency and the use of astringent injections. A truss, consisting of a compress supported by a spiral spring, so as to press

upon the external labia, I have found of the greatest utility, when an internal pessary could not be borne. I cannot speak in too high terms of this instrument, which is constructed by Mr. Eagland of Leeds. It is applicable not only to this relaxation of the walls of the vagina, but also to most cases of procidentia or prolapsus of the womb. The subjoined figure will convey to the mind of the reader a much better idea of the form and aptitude of this truss for the purpose above recommended than the most elaborate verbal description.

Fig. 60.



CHAPTER XIII.

PUDENDAL HERNIA.

HERNIÆ occurring at the outlet of the pelvis, instead of protruding the vagina, or descending immediately in front or at the side of the anus, occasionally descend along the side of the vagina into the labium pudendi.

Sir Astley Cooper has described a pudendal hernia, which became strangulated, and was reduced by the taxis. The tumour was situated below the middle of the labium; the upper part of the labium and the external ring being unoccupied, and free from tumefaction. On examination from the vagina, the tumour could be felt extending within the pelvis, nearly as far as the os uteri.

Scarpa has described a pudendal hernia formed by a descent of intestine; but the majority of pudendal herniæ which have been recorded are cystoceles. Mr. Roberton has related a case which occurred in a female aged twenty-three. The tumour was soft, and slightly elastic, about the size of a small egg, occupying the middle of the right labium on its inner or mucous surface. Pressure caused it nearly to disappear, and at the same time excited a desire to empty the bladder. The line of descent of the bladder could be traced behind the wall of the vagina.

Mr. A. Burns had the opportunity of dissecting a case of double pudendal hernia, formed by a descent of the bladder into each labium. Having exposed the contents of the abdomen, and removed the small intestines from the pelvis, he

found the urinary bladder stretched across the pelvis, with its long diameter directed from side to side. Also in the centre of the pelvis it was so much depressed, that the upper surface of the vagina was forced out between the labia pudendi laterally: the shoulder of the bladder on each side was pulled out into processes, which were traced descending like horns on each side of the vagina. When the cavity of the bladder was exposed by a transverse section, it was clearly ascertained that the protrusion had on both sides taken place from that part of the bladder which is situated below the angle of reflection of the peritoneum; consequently there was no peritoneal sac. The tumour had descended between the levator ani and obturator internus muscles, pushing the obturator vessels and nerve against the bone, and itself was closely embraced by the curved membranous origin of the levator ani. Several other cases of pudendal cystocele have been recorded.

This form of hernia may be distinguished from inguinal hernia descending into the labium, by the upper part of the labium and the external ring being unoccupied by the tumour, and by the tumour admitting of being traced upwards into the pelvis by the side of the vagina. The tumour formed by suppuration of Duverney's gland, or in consequence of obstruction of its duct, is distinguished from pudendal hernia by its fluctuation, by not becoming dilated on coughing, nor being continued upwards into the pelvis along the wall of the vagina.

In the case communicated to Sir A. Cooper by Dr. Best, strangulation occurred; but reduction was effected by the taxis after firm pressure had been employed for three minutes.

In the case related by Mr. Robertson, relief was obtained from the use of the sponge pessary, and ultimately a permanent cure was effected. A common female bandage afforded relief in Dr. Best's case. Pessaries of various forms, more

especially the hollow cylindrical pessary, might be beneficially employed.

Sir Astley Cooper observes, “ If the hernia cannot be reduced, and the symptoms of strangulation continue, an operation ought to be performed, which, although difficult, is certainly far from impracticable. An incision should be made into the labium, to expose the lower part of the tumour; and, the lower part of the sac being carefully opened, and the intestine exposed, a concealed bistoury should be passed up the sac, and directed by the finger previously introduced into the vagina: the division of the mouth of the sac ought to be made directly inward towards the vagina. The bladder should be emptied previous to the operation, and even before the first attempts at reduction are made.”

CHAPTER XIV.

DIAPHRAGMATIC HERNIA.

THE viscera of the abdomen occasionally protrude into the thorax in consequence of malformations of the diaphragm, wounds or lacerations of this muscular and tendinous expansion, or a gradual separation of its fibres, and a yielding of the serous membranes which invest it.

When the hernia results from congenital deficiency, or from wounds or lacerations of the diaphragm, it is devoid of a sac, the peritoneal and pleural cavities being in these cases continuous. When it takes place in consequence of a gradual yielding or separation of the fibres of the diaphragm, it possesses a distinct sac, formed conjointly by the peritoneum and pleura.

The records of pathology ²⁸⁵ contain numerous illustrations of the different forms of diaphragmatic hernia, of which I propose to confine myself to a brief notice of a few only of the principal varieties of the affection.

Sometimes there is an extensive congenital deficiency, or almost an entire absence of the diaphragm. In such cases the viscera of the abdomen pass freely into the thorax, and, by obstructing respiration, soon destroy the life of the infant.*

When the opening is less extensive, life has been prolonged for some months; and in cases where the preternatural aperture has been small the subjects have lived to adult age, suffering occasional paroxysms of intestinal obstruction, attended with embarrassment of respiration, and have ultimately sunk under symptoms of strangulation.²⁸⁶

* See cases by Dr. Macauley in the *Medical Observations and Inquiries*, vol. i. p. 25; Cooper on *Hernia*, Part II. p. 68, &c.

Morgagni²⁸⁷ has related an instance of hernia occurring through the passage which transmits the œsophagus. The space, however, was preternaturally large, and its boundaries relaxed.

Several instances have occurred in which an aperture was formed in the diaphragm, either in the muscular or tendinous portions, from violent vomiting,²⁸⁸ falls or blows,²⁸⁹ fractured ribs,²⁹⁰ or penetrating wounds.²⁹¹ The subjects of these injuries have frequently recovered from their immediate effects, but have subsequently experienced interruptions in the functions of the alimentary canal, and have ultimately died from strangulation of the abdominal viscera.

It has been already stated that diaphragmatic hernia has sometimes a distinct sac. Mr. Bowles of Bristol examined the body of a man, aged fifty, and, on inspecting the thorax, found a sac considerably larger than a tennis-ball in its right cavity, which contained part of the stomach, duodenum, omentum, and arch of the colon. The sac was formed by the united membranes of the pleura and peritoneum, and its orifice was placed at a small distance from the right side of the ensiform cartilage, where there appeared a deficiency of fibres in the large muscle of the diaphragm corresponding to the size of the sac. Several similar cases have been recorded by Lieutaud, Petit, Bécларd, Bignardi, and others.

M. Cruveilhier, in his seventh fasciculus, states, that a great number of facts lead him to conclude that an accidental or acquired diaphragmatic hernia is produced in the following manner. A mass of fat is formed between the peritoneum and the diaphragm behind the ensiform cartilage; this, gradually increasing, separates the fibres of the diaphragm, and penetrates into the mediastinum; the peritoneum, dragged by the tumour, follows it, and slowly the viscera protrude.

The occurrence of symptoms of strangulation of the alimentary canal, existing in conjunction with sudden oppression of the respiratory organs without the ordinary indica-

tions of thoracic disease, and with great pain in the region of the diaphragm on attempting to call this muscle into exercise, or on performing the general movements of the trunk, might lead to a suspicion of the existence of the disease, but there are no symptoms by which the diagnosis can be positively determined.

LIST

OF

REFERENCES TO WORKS QUOTED.

1. Recherches sur les Causes et l'Anatomie des Hernies Abdominales, par
Jules Cloquet, 1819, p. 16.
2. ————— p. 16.
3. ————— p. 21.
4. ————— pp. 39, 41.
5. ————— p. 145.
6. Med. Chir. Trans., vol. iv., p. 325.
7. Breschet, Considérations sur la Hernie Femorale, p. 51.
8. Mém. de l'Acad. de Chir., t. i., p. 518.
9. ————— t. iv., p. 249.
10. Lallement, Dict. de Méd. et de Chirurg., t. ix., p. 577.
Archives Générales de Médecine, t. 22, p. 139.
11. Mém. de l'Acad. de Chir., t. 1, p. 1.
12. Littre, Mém. de l'Acad. des Sciences, 1700.
Mery. ————— ditto.
Edin. Med. Essays, vol. i., p. 183.
Aymand, Philos. Trans., No. 443.
Else, Med. Obs. and Enquiries, vol. iv., p. 334.
13. Sandifort, Icones Herniæ Congenitæ, 4to, L. B., 1781.
14. Mém. de l'Académie de Chir., tom. ii., p. 10.
15. Mém. de l'Acad. des Sciences, 1713.
16. Mém. de l'Acad. de Chir., t. ii., p. 1.
17. Sir Astley Cooper on Hernia, part ii., p. 64, second Edit.
18. Mémoires de la Soc. Roy. de Montpellier, t. i., p. 119.
————— des Curieux de la Nature, décad. ii., an. 5. obs. 71.
Cloquet, Maladies des Voies Urinaires, t. ii., p. 71.
Bartolini, Hist. d'Anat., cent. iv.
Mém. de l'Acad. de Chir., t. ii.

18. Pott's Works.
Lawrence on Ruptures, fifth edit.
19. Mém. de l'Acad. de Chir., t. ii.
20. Mém. de Chir., par Arnaud, t. i. p. 79.
21. Monton, Dict. des Sciences Méd., t. vii., p. 669.
22. Ratio Medendi, t. iii., p. 429.
23. Dissert. on Hernia, translation, preface, p. 39.
24. Manual, &c., introduction, p. 10.
25. Monro, Morbid Anatomy of Human Gullet, p. 316.
26. Marshall, Hints to Young Medical Officers, appendix, p. 181.
27. Malgaigne, Leçons Cliniques sur les Hernies, 1841, p. 19.
28. _____ p. 12.
29. Diss. de Oscheo-entero-et-bubonocoele, Helvetiæ incolis frequentibus.
30. Medicinische Bibliothek, b. i., p. 725.
31. On Hernia, second edit., part i., p. 18.
32. _____
33. Leçons Cliniques, p. 16.
34. Medico-Chirurgical Transactions, vol. xvi.
35. Cloquet, Recherches sur les Causes des Hernies, p. 101.
36. Med. Chir. Trans., vol. xvi., p. 254.
37. Cooper on Hernia, part i., p. 36.
38. Dissertation on Hernia, p. 316.
39. Stephens, Treatise on Obstructed and Inflamed Hernia.
40. Dupuytren, Leçons Orales, t. iii., p. 129.
41. Mr. T. Wilkinson King, in Guy's Hospital Reports, vol. iii., p. 372.
42. Mr. Key, Memoir, p. 129.
43. Dupuytren, Leçons Orales, t. iii., p. 610.
44. Arnaud, Dissertations on Hernia, p. 354 and following pages.
Scarpa, by Wishart, p. 140.
Dupuytren, Leçons Orales, t. iii., p. 588, and following.
45. Guy's Hospital Reports, vol. iii.
46. Hey, Practical Observations, pp. 106, 205.
47. Morgagni, De Causis et Sedibus Morborum.
48. St. Thomas's Hospital Reports, Rp. xxxiv., art. 15.
49. Report on the Radical Cure of Hernia by means of Trusses with Solid
Blocks, read before the Philadelphia Medical Society, April 29, 1837.
British and Foreign Medical Review, Jan. 1838.
50. Malgaigne, Leçons Cliniques, p. 111.
51. Report on Radical Cure, Brit. and For. Med. Rev., vol. v., p. 302.
52. Dionis, Cours d'Opérations, t. ii., p. 464.
53. Histoire de la Société Royale de Médecine, t. i., p. 289.
54. Thierry, Des Diverses Méthodes Opératoires pour la Cure Radicale des
Hernies, p. 36.
55. Traité des Maladies Chirurgicales, t. ii. p. 354.

56. Abernethy, Surgical Observations, part ii., p. 5, et seq.
57. Mémoire sur le Danger des Caustiques pour la Cure Radicale des Hernies, in Mém. de l'Acad. Royale de Chir., t. v., p. 651, and the Supplement, p. 881.
58. Schmucker, in Chirurg. Wahrnehm., book ii., p. 236 et seq.
59. Langenbeck, Bibliothek für die Chirurgie, band. ii., 1808, p. 729.
60. Nouveaux Eléments de la Médecine Opératoire, 1839.
61. Bonnet, Gazette Médicale, Dec. 9, 1837.
Bulletin Générale de Therapeutique, t. x., Mag. 1836.
Brit. and For. Med. Rev., Oct. 1838.
62. Belmas, Revue Médicale, Mars, 1838.
Brit. and For. Med. Rev., Oct. 1838, p. 437.
63. Malgaigne, op. cit., p. 121.
64. Saviard, Obs. Chirurg. ix.
65. Parisian Chirurgical Journal, translated by Gosling, vol. ii., p. 189.
66. Nosographie Chirurgicale, t. ii., p. 453.
67. Thierry, op. cit., p. 65 et seq.
68. Lancet, 1828-9, vol. ii., p. 142, extracted from the American Medical Recorder.
69. Brit. and For. Med. Rev., Oct. 1838, p. 349.
Thierry, op. cit., p. 73.
70. Mr. Bransby Cooper, in Guy's Hospital Reports, vol. v., p. 272.
71. Signorini, Encyclographie des Sciences Med., May, 1837.
72. Thierry, op. cit., p. 79.
73. Cases by Petit, Traité des Maladies Chirurgicales, t. ii., p. 392.
Arnaud, Mémoires de Chirurgie, t. ii., p. 495.
74. Dr. Macfarlane, in Med. Chir. Trans., vol. xvi., p. 269.
75. Cloquet, Recherches, &c., p. 102.
76. Petit, op. cit., t. ii., p. 302-4.
Pott's Works, vol. iii., p. 247.
77. Pott, op. cit., p. 239.
78. Macfarlane, Clinical Report of Glasgow Infirmary.
79. Mr. T. W. King, Guy's Hospital Reports, vol. iii.
80. Desault, Journal de Chirurgie et Œuvres Chirurgicales.
81. Cooper on Hernia, part i., p. 34.
82. Dr. Macfarlane, Med. Chir. Trans., vol. xvi., p. 269.
83. M. Vela, in Gazette des Hopitaux. See Lancet, Dec. 3, 1842.
84. Mr. Hey, Retrospective Address, 1842, Prov. Med. Ass. Trans., vol. xii., p. 199.
85. Pott's Works, vol. ii., p. 174.
86. Sir A. Cooper, op. cit., part i., p. 33.
87. Mr. B. B. Cooper, in Med. Gaz., vol. xxi., p. 111.
88. Desault, op. cit., t. ii., p. 344.
Velpeau, Nouveaux Elem. de Méd. Oper., t. ii., p. 352.

88. Edin. Med. and Surg. Journ., vol. ix., p. 159.
89. Dr. O'Beirne, Dub. Journ. of Med. Science, Sep. 1, 1838.
Brit. and For. Med. Rev., Oct. 1838.
90. Croissant Garengeot, Obs. Chir. Trans., London, 1723, p. 132.
91. Munro, Description of the Bursæ Mucosæ, p. 43.
92. Sir A. Cooper, op. cit., part i., p. 66.
93. See also Med. Chir. Rev., January, 1834.
94. Mr. Key, op. cit., p. 47.
95. Mr. Lawrence, op. cit., p. 263.
96. Mr. Key, op. cit., p. 134, plate 1.
97. Sir B. Brodie, Clinical Lecture, Med. Gaz.
98. Louis, Mém. de Chir., tom. iii., p. 305.
99. Inquiry into the Process of Nature, &c., p. 333.
100. Lawrence, op. cit., p. 277.
101. Arnaud, Treatise on Ruptures, English translation, pp. 309, 339.
102. Dupuytren, Jobert. Mal. Chir. de Canal Intest., t. ii., p. 69.
103. Key, Cooper on Hernia, part i., p. 48.
104. Desault, Parisian Chirurgical Journal, t. ii., p. 366.
105. Scarpa, op. cit.
106. Sir A. Cooper, op. cit., part i., p. 49.
107. Velpeau, Journal Hebdomadaire, Juillet, 1836.
108. Mr. Lawrence, op. cit., p. 520.
109. Breschet, Considérations, &c., sur la Hernie Femorale, p. 30.
110. Arnaud, op. cit., p. 325.
111. Richter, Loder's Journal, b. i., p. 19.
Scarpa, op. cit., p. 190.
112. London Med. Gaz., vol. viii., p. 658.
113. Sir A. Cooper, op. cit.
114. Arnaud, op. cit., pp. 331 and 335.
115. ——— op. cit., p. 320.
116. Chopart, Desault, Hey, Opera Cit.
117. Arnaud, Mém. de Chir., t. ii., p. 627.
118. Pott's Works, vol. ii., pp. 161, 165.
119. Caque, in Mém. de l'Acad. de Chir., t. iii.
Lawrence, op. cit., p. 457.
Ponreau, Blair.
120. Caquè, op. cit., t. iii.
Hey's Pract. Obs., second edit., pp. 188, 193.
Lancet, vol. xii., p. 638.
121. Sir A. Cooper, op. cit., part i., p. 44.
122. ——— op. cit., part i., pp. 45-47.
Mr. Lawrence, op. cit., p. 302.
123. Mr. Travers, Inquiry, &c., p. 134.
124. Philos. Trans., vol. i., p. 35.
Glendorpius, Obs. Chir. Speciales, pp. 33 and 34.

125. Lawrence, op. cit., p. 272.
126. ————— p. 302.
127. Quoted by Mr. Lawrence, from Rust's Mag., vol. xlv., p. 176.
128. Cooper, op. cit., part ii., p. 4.
129. Bertrandi. Trattato delle Operazioni, and Arnaud.
130. Sir A. Cooper, op. cit., part i., p. 41. Op. cit., t. ii., p. 755.
Hey's Pract. Obs.; and Lawrence, p. 512.
131. Dissertations on Hernia, English translation.
132. Leçons Orales de Cliniques Chirurgicales, t. iii., 1839.
133. Medico-Chirurgical Trans., 1843.
134. Treatise on Hernia, translated by Wishart, p. 239.
135. ————— p. 300.
136. ————— p. 305.
137. Inquiry into the Process of Nature in Repairing Injuries of the
Intestines, p. 358.
138. Treatise on Hernia, &c., p. 306.
139. Dictionnaire de Médecine et de Chirurgie Pratiques, Art. Anus
Anormal, t. iii., p. 139.
140. ————— p. 137.
141. Dupuytren, Mémoire sur une Méthode Nouvelle pour traiter les Anus
Accidentelles, dans les Mémoires de l'Académie Royale de Médecine,
t. i., p. 464.
142. Lawrence on Ruptures, fifth edition, p. 383.
143. Dictionnaire de Méd. et Chir. Prat., t. iii., p. 133.
144. Mém. de l'Acad. Royale de Chir., tom. v., p. 400.
145. Diss. de Morbis a situ Intestinorum preternaturali, in Halleri Disp.
Chir., tom. iii., p. 78.
146. Scarpa, Wishart's translation, p. 304.
147. Œuv. Chirurg., t. ii., p. 370 et seq.; and Lawrence on Ruptures, p. 392.
148. Scarpa, op. citat., p. 240.
149. Relat. Chirurg. de l'Armée d'Orient, p. 300.
150. Mém. de l'Acad. Royale de Méd., 1828, t. i., p. 281.
151. Dict. de Méd. et de Chir. Prat., tom. iii., p. 149.
152. The views of Dupuytren on the treatment of Abnormal Anus by the
Enterotome, were originally expounded in his Clinical Lectures,
and first published in Germany, in 1817, by M. Reisinger. A further
account was published in England, in the Quarterly Journal of
Foreign Medicine and Surgery, Nos. 9 and 10, by M. Breschet. At
a later period, M. Dupuytren himself embodied his own views in
essays published in the Mémoires de l'Acad. Royale de Méd., t. i.,
1828; and in the Dict. de Méd. et de Chir. Pratiques, t. i., 1829.
The treatise of Mr. Lawrence on Ruptures, fifth edition, contains
a full notice of the proceeding of Baron Dupuytren.
153. This case is quoted at length by Mr. Lawrence, p. 408, from the
Report General d'Anat. et de Phys. Path. t. vii., p. 133.

154. *Journal Hebdomadaire*, Juillet, 1836.
155. *Practical Observations in Surgery*, second edition, p. 225.
156. *Journal Hebdom.*, Juillet, 1836.
157. Cooper on *Hernia*, second edition, part i., p. 53.
158. *Traité des Bandages Herniaires*, sect. viii., pl. 7 and 8 ; and Lawrence on Ruptures, p. 388.
159. *Mém. de l'Acad. de Chir.*, t. i.
160. *Physiological Anatomy and Physiology of Man*, part i., p. 161.
161. Lawrence on Ruptures, pp. 202-3.
162. Sir Astley Cooper on the Structure and Diseases of the Testis, p. 39.
163. *De Testiculorum ex Abdom. in Scrot. Descensa*, p. 24.
164. *Ibid*, p. 30. Gottingen, 1779.
165. *Hints to Young Medical Officers in the Army*, p. 83.
166. *Practical Treatise on the Diseases of the Testis*, p. 67.
167. Works by Palmer, vol. iv., p. 15.
168. *Comment. Reg. Soc.*, Gottingen, 1778, p. 71.
169. *Recherches sur les Causes*, &c., p. 24.
170. Wilson's *Lectures on the Urinary and Genital Organs*, p. 405.
171. *Lib. cit.*, p. 68.
172. Quoted by M. Malgaigne, *Leçons Cliniques*, p. 49.
173. *Recherches Anatomiques*.
174. *Lib. cit.*, p. 29.
175. Works, with notes, by Palmer, vol. iv., p. 7.
176. *Observations on the Structure and Diseases of the Testis*.
177. *Lib. cit.*, p. 30. Wrisberg.
178. M. Malgaigne, *lib. citat*, p. 48.
- 179.
180. *Op. cit.*, plate 4.
181. *Op. cit.*, plate 9.
182. Lawrence, *op. cit.*, p. 216.
183. Cooper, pl. 5, fig. 5. Scarpa, pl. 3. Camper, tab. 8, fig. 1.
184. Camper, tab. 8, fig. 2.
185. Ditto, ditto, fig. 1. Pott's Works, v. ii., p. 5.
186. Hey's *Pract. Obs.*, p. 140. Cooper on *Hernia*, part i., p. 15.
187. Richerand operated upon a case of Inguinal Hernia, in which the testicle formed an evident projection upon the anterior and inferior part of the Hernia.—*Dict. des Sciences Médicales*, tab. 21, p. 133.
188. *Monro, Morbid Anatomy of Human Gullet*, p. 467.
189. Wilmer, *Pract. Obs. on Herniæ*, p. 106.
190. Scarpa, by Wishart, p. 42.
191. Lawrence, fifth edition, p. 237.
192. Scarpa, *op. cit.*, p. 231.
193. Pott's Works, vol. ii., p. 263.
194. Scarpa, *op. cit.*, p. 231.

195. Liston, *Practical Surgery*, 1837, p. 444.
196. Desault, *Journal de Chirurgie*, t. i., p. 251.
Lallement, *Mém. de la Société d'Emulation*, t. iii., p. 321.
197. Cloquet, *Recherches Anatomiques, &c.* Curling, *op. cit.*, p. 225.
198. Arnaud, *op. cit.*, p. 405.
199. Hey, *Prov. Med. Trans.*, vol. xii., p. 197.
200. Macilwain, *Surgical Obs.*, p. 253.
Morton, *Surgical Anatomy of Inguinal Hernia*, p. 297.
201. Cooper, *op. citat.* Cloquet, *op. cit.*
202. Lawrence, *op. cit.*, p. 253.
203. Morton, *op. cit.*, p. 296.
204. Malgaigne, *op. cit.*, p. 124.
205. Ditto, ditto, p. 111.
206. Ditto, ditto, p. 109.
207. Report of Committee of Philadelphia Medical Society, p. 136.
208. *Nouveaux Elem.*
Mr. Luke, *Med. Gaz.*, vol. ix., p. 102.
209. Velpeau, *Nouveaux Elem.*, tom. ii., p. 459.
210. Malgaigne, *Legons Cliniques, &c.*, p. 41.
211. Cloquet, *op. citat.* p. 23, pl. 7, figs. 2 and 3.
212. ————— p. 24, pl. 5, fig. 2.
213. Pott's *Works*, vol. ii., p. 184.
214. Cooper on *Hernia*, part i., p. 78.
Todd, *Dublin Hospital Reports*, vol. i., p. 240.
Liston, *Operative Surgery*, second edition, p. 468.
215. Lawrence, *op. citat.* p. 256.
216. Monro, *Morbid Anat. of Human Gullet*, p. 467.
217. Wrisberg, *Comment. Reg. Soc. Scient.*, Gottingen, 1778, p. 71.
Idem, *Icones Herniæ Congenitæ*.
Meckel, *De Morbo Hernioso Congenito, &c.*, 1772.
Langenbechii, *Commentarius*, tab. 10
218. Pott's *Works*, vol. ii., p. 415.
219. Wrisberg, *op. citat.* pp. 69 and 70.
220. Lawrence, *op. cit.*, p. 575.
221. Mr. Key, *Memoir*, p. 128.
222. M. Goyrand, *Mém. de l'Acad. de Méd.*, tom. v., p. 28.
223. Mr. Todd, *Dublin Hospital Reports*, vol. i., p. 232.
224. Mr. Lawrence, *op. cit.*, p. 226.
225. ————— p. 226.
Cloquet, *op. cit.*, p. 83.
Case by Mr. Key. Cooper on *Hernia*, part i., p. 70.
Morton, *Surgical Anatomy of Inguinal Hernia*, p. 290.
226. Mr. Todd, *op. cit.*, p. 231.
227. Sir Astley Cooper, *op. cit.*, part i., pl. 10.

228. Hesselbach, *Jehre*, p. 143.
229. Lawrence, *op. cit.*, p. 230.
230. Report of Philadelphia Medical Society, p. 62.
231. Lawrence, *op. cit.*, 481.
232. Cloquet, *op. cit.*, p. 72, note.
233. Hesselbach, *Ueber den Ursprung und der Verlauf, &c.*, p. 26.
234. Velpeau, *Nouv. Elem.* t. ii., p. 480.
235. Tiedeman, *Explic. Tab. Arter. Corp. Hum.*, p. 295.
236. Sir Astley Cooper, *op. cit.*, part ii., p. 26.
237. Lawrence, *op. cit.*, p. 482.
238. Monro, *Anatomy of the Human Gullet*, p. 485.
239. *Ib.*, p. 483.
240. *Concours, &c.*, bb. xxviii., p. 153.
241. Cloquet, *op. cit.*, p. 85.
242. Lawrence, *op. cit.*, p. 484.
243. Macilwain, *Surgical Observations*, p. 293.
244. Stanley. See Lawrence on Ruptures, p. 486.
245. Cloquet, *Recherches Anatomiques sur les Hernies*, p. 85, propos. 46.
246. Saviard, *op. cit.*, p. 50.
247. Hesselbach, *op. cit.*, p. 157.
248. Lallement, *Dict. des Sciences Médicales*, t. xxxii., p. 513.
249. Verdier, *Mém. de l'Acad. de Chirurg.*, vol. ii., p. 17.
250. Morton, *Surgical Anat. of the Groin*, p. 146.
251. Sir Charles Bell, *Illustrations of the Great Operations*, p. 41.
252. Callisen, *Dict. des Sciences Médicales*, t. xxxii p. 514.
253. *Memoir*, p. 145. See Mr. Key's excellent description of the Femoral Sheath, in the second edition of Sir Astley Cooper's work on Hernia, part i., p. 12; also Sir Astley Cooper's *Observations*, part ii., p. 14, and note by Mr. Key.
254. Malgaigne, *op. cit.*, p. 200.
255. Cases of this affection have been recorded by Sir A. Cooper, part ii., p. 4. Petit, *Traité des Maladies Chirurg.*, t. 2, p. 299.
Lawrence on Ruptures, fifth edition, p. 497.
Macilwain, *Surgical Obs.*, p. 300.
Morton, *Surgical Anat. of the Groin*, p. 139.
256. Malgaigne, *op. cit.*, p. 178.
257. Albinus, *Annotationes Acad.*, lib. i., tab. 5, fig. 5.
258. Wrisberg, *Descript. Anat. Embryonis, &c.*, figs. 1 and 2.
259. Scarpa, *op. cit.*, pl. 10, figs. 1, 2, and 4.
260. Bonn, *Tab. Anat. Chir. Doctrinam Herniar*, illust. edit., a Girardo Sandifort, tabs. 17 and 18. In Mr. Lawrence's work, p. 536, are numerous references to authors who have written upon this affection.
261. *Œuvres Chirurg. de Desault*, par Bichat, t. ii., p. 318.
262. Colles, *Treatise on Surgical Anatomy*, p. 98.
263. Lawrence, *op. cit.*, p. 532.

264. Sir Astley Cooper, *op. cit.*, part ii., p. 31.
265. Mr. Hey, *Practical Obs. on Surgery*, second edit., p. 232.
266. Peyrouse, *Mém. de l'Acad. de Chir.*, tom. iv.
267. M. Littré, *Mém. de l'Acad. des Sciences*, 1714.
268. Scarpa, *Wishart's Translation*, p. 388.
269. *Provincial Med. and Surg. Journal*.
270. Lawrence, *op. cit.*, page 581, note.
271. Cloquet, *op. cit.*, p. 4.
272. Simon, *Mém. de l'Acad. de Chir.*, tom. i.
273. *Prov. Med. and Surg. Journ.*, p. 632—Case of Strangulated Ventral Hernia, by Mr. T. P. Teale.
274. Sir Astley Cooper, part ii., p. 61.
275. Garengeot, *Mém. de l'Acad. Royale de Chir.*, t. i., p. 527.
276. Malaval, ————— t. i., p. 529.
277. *Mém. de l'Acad. de Chir.*, t. i., p. 529.
278. ————— p. 618.
279. *Journal de Corvisart*, t. xxv.
280. Sir Astley Cooper, part ii., p. 67.
281. *Mém. de l'Acad. de Chir.*, t. ii., p. 2.
282. *Demonstrationes Anatomicæ Path.*, lib. ii., p. 17.
283. Graefe and Wathers *Journal*, vol. ix., p. 399.
284. Robertson, in *Edin. Med. and Surg. Journal*, vol. xli.
285. See numerous references on this affection, in Mr. Lawrence's valuable *Treatise on Ruptures*, p. 624 ; and *Dissertatio Inauguralis de Hernia Diaphragmatis*, by Dr. H. G. Ikerling, Heidelberg, 1834.
286. Cooper on Hernia, part ii., p. 69.
287. Morgagni, *De Causis et Sedibus Morborum Epistolæ*, 54, art. 13.
288. Lieutaud, *Hist. Anat. Med.*, lib. i., sect. 2, obs. 208, tom. i., p. 51.
Bonetus, *Sepulchr.* lib. iii., sect. 8, obs. 27, § 2.
289. Desault, *Journal de Chir.*, tom. iii., art. 2.
Cooper on Hernia, part ii., p. 71.
Medical Gazette, vol. xii., p. 673.
290. Cooper on Hernia, part ii., p. 71.
Watson, *Essays on Surgical Pathology and Practice*.
291. Lieutaud, *op. cit.*, lib. i., sect. 4, obs. 510, tom. i., p. 119.
Sennert, *Med. Pract.*, lib. ii., cap. 15.
Greetham, *Med. Gaz.*, vol. x., p. 43.
Watson's *Essays*, part i., p. 29.

LONDON :

Printed by S. & J. BENTLEY, WILSON, and FLEY,
Bangor House, Shoe Lane.

A CATALOGUE OF WORKS

IN ALL BRANCHES OF

MEDICINE AND SURGERY,

INCLUDING THE

Collateral Sciences,

PUBLISHED BY

LONGMAN, BROWN, GREEN, AND LONGMANS,

39, Paternoster Row, London.

CLASSIFIED INDEX.

ANATOMY.

PAGES

Cooper's (Sir A.) Anatomy of the Breast ..	6
Lefevre's (Sir G.) Apology for the Nerves..	9
Owen On Comparative Anatomy	11
Swan's New Method of Making Dried Anatomical Preparations.....	14
—— Illustrations of the Nervous System	14
—— Demonstration of the Nerves	14
Wagner's Comparative Anatomy.....	15
Wilson's Practical Anatomy	16

BOTANY.

Henslow's Descriptive & Physiological Botany	7
Hooker's British Flora.....	8
—— Compendium of the English Flora	8
Lindley's (Dr.) Synopsis of the British Flora	9
—— Introduction to Botany	9
—— Flora Medica	10
Loudon's Encyclopædia of Plants.....	10
Smith's (Sir J. E.) Introduction to Botany..	13
—— English Flora.....	14

CHEMISTRY & GENERAL SCIENCE.

Acton's Modern Cookery	4
Balmain's Lessons on Chemistry.....	4
Brande's Dict. of Science, Literature, & Art	5
Donovan's Treatise on Chemistry.....	7
Hunt's Researches on Light	8
Kane's (Dr.) Elements of Chemistry	8
Lardner's Cabinet Cyclopædia	8
—— and Walker's Electricity	8
Lectures on Polarized Light	9
Low On the Nature of the Simple Bodies of Chemistry.....	10
Rees On the Analysis of the Blood and Urine	12
—— the Analysis of Inorganic Bodies..	12
Reid (Dr. D. B.) on Ventilation	13
Sandby on Mesmerism	13
Thomson's (Dr. Thomas) Chemistry of Animal Bodies.....	15
Ure's (Dr.) Dictionary of Arts, Manufactures, and Mines	16

MATERIA MEDICA, PHARMACY, AND TOXICOLOGY.

PAGES

Ainslie's (Sir W.) Materia Indica	4
Pereira's (Dr.) Elements of Materia Medica and Therapeutics	12
Thomson's (Dr. A. T.) Conspectus	14
—— Materia Medica	14
—— London Dispensatory	14

MEDICINE—GENERAL.

Aldis's (Dr.) Introduction to Hospital Practice.....	4
—— Minutes of Evidence	4
Bright and Addison's (Drs.) Elements of Medicine	5
Copland's (Dr.) Dictionary of Medicine	6
Holland's (Dr. H.) Medical Notes and Reflections	7
Hooper's (Dr.) Medical Dictionary	8
Latham's (Dr. P. M.) Lectures on Clinical Medicine	8
M'Cormac's Methodus Medendi	10
Neligan's Medicines, their Uses and Mode of Administration.....	11

MEDICINE—POPULAR.

Bull's (Dr.) Hints to Mothers.....	5
—— On the Maternal Management of Children	5
Frankum On the Enlarged and Pendulous Abdomen	7
Graham On the Graefenberg Water-Cure..	7
Macaulay's (Dr.) Dictionary of Medicine ..	10
Moore (Dr.) On the Power of the Soul over the Body	11
Pereira's (Dr.) Treatise on Food and Diet..	12
Philip (Dr.) On Protracted Indigestion	12
—— those Diseases which precede Change of Structure	12
Reece's (Dr.) Medical Guide	12
Thomson's (Dr. A. T.) Domestic Management of the Sick Room.....	15
West On Pyrosis Idiopathica.....	16

MEDICINE—FORENSIC.

	PAGES
Beck's (Drs. T. R. and J. R.) Medical Jurisprudence	4

MEDICAL LITERATURE.

Aldis's (Dr.) Minutes of Evidence	4
Lefevre's Apology for the Nerves	9
Life (The) of a Travelling Physician.....	9
London Medical Gazette	3
Marx and Willis on the Decrease of Disease by Civilization	11
Moore (Dr.) On the Power of the Soul over the Body	11
Transactions of the Medical and Chirurgical Society ..	15
Wigan (Dr.) On the Duality of the Mind ..	16

MIDWIFERY, ETC.

Burns's (Dr.) Principles of Midwifery.....	5
Churchill's (Dr.) Observations on Pregnancy	6
——— Outlines of the Principal Diseases of Females	6
——— Researches on Operative Midwifery.....	6
Conquest's (Dr.) Outlines of Midwifery	6
Clarke (Sir C. M.) on the Diseases of Females ..	6
Lee's (Dr.) Lectures on the Theory and Practice of Midwifery	9
Maunsell's Dublin Practice of Midwifery ..	11
——— and Evanson on the Management and Diseases of Children.....	11

NEUROLOGY.

Brodie (Sir Benjamin) on Nervous Affections ..	5
Laycock (Dr.) On Nervous Diseases of Women ..	9
Lefevre's (Sir George) Apology for the Nerves ..	9
Travers On Constitutional Irritation	15
———'s Further Inquiry on ditto.....	15
Swan On Diseases, &c. of the Nerves	14

OPHTHALMOLOGY.

Mackenzie (Dr.) On Diseases of the Eye....	10
———'s — Physiology of Vision.....	10
Middlemore On Diseases of the Eye	11
Walker's Oculist's Vade-Mecum	15

PATHOLOGY.

Alison (Dr.) On Organic Alterations of the Heart.....	4
Annesley (Dr.) On the Diseases of Warm Climates	4
Bateman (Dr.) On Cutaneous Diseases	4
Bright's Reports of Medical Cases	5
Brodie (Sir Benjamin) On Diseases of the Urinary Organs	5
——— Diseases of the Joints.....	5
Carmichael's Lectures on Venereal Diseases ..	5
Coulson On the Hip-Joint	7
——— Bladder, &c.....	7
Curling On the Diseases of the Testis, &c..	7

PATHOLOGY—continued.

	PAGES
Graves's System of Clinical Medicine.....	7
Kramer (Dr. W.) On Diseases of the Ear ..	8
Latham (Dr.) On Diseases of the Heart....	8
Lever (Dr.) On Organic Diseases of the Uterus	9
Little (Dr.) On Ankylosis, or Stiff-Joint....	10
——— On Club-Foot	10
Macleod (Dr.) On Rheumatism	10
M'Cormac On Continued Fever.....	11
Ramadge's (Dr.) Consumption Curable....	12
Ricord (Dr.) On Venereal Diseases	13
Seymour (Dr.) On Diseases of the Ovaria..	13
——— the Treatment of Dropsy ..	13
——— Treatment of Insanity ..	13
Sheppard On the Cause of Insanity.....	13
Skey On New Treatment of Ulcers, &c....	13
Smith (Dr. Southwood) On Fever.....	14
—— (Dr. T.) On Hydrocephalus	13
Thomson's (Dr. A. T.) Atlas of Cutaneous Eruptions	14
Travers On Intestinal Injuries	15
——— Venereal Affections.....	15
Walne's Cases of Dropsical Ovaria	16
Willis On Mental Derangement	16

PHYSIOLOGY.

Elliotson's (Dr.) Human Physiology	7
Richerand's Elements of Physiology	13

STRUCTURAL DEFORMITY & FRACTURES.

Coulson On the Chest and Spine	7
Little on Club-Foot	10
Skey On New Operation for Lateral Curvature of the Spine.....	13
Stafford On Diseases of the Spine	14

SURGERY.

Amesbury On Fractures	4
Cooper's (S.) Dictionary of Surgery.....	6
——— First Lines of the Theory and Practice of Surgery	6
Liston's Elements of Surgery.....	10

VETERINARY ART.

Field's Extracts from the Veterinary Records of John Field	7
Knowlson's Cattle Doctor and Farmer	8
Morton's Toxicological Chart.....	11
——— Manual of Veterinary Pharmacy ..	11
Percivall's Anatomy of the Horse.....	11
——— Hippopathology.....	11
Spooner On the Foot and Leg of the Horse ..	14
Turner On the Foot of the Horse.....	15
White's Compendium of the Veterinary Art ..	16
——— Cattle Medicine ..	16
The Veterinarian	16
The Veterinary Record.....	16

THE
LONDON MEDICAL GAZETTE;
OR,
Journal of Practical Medicine.

A NEW SERIES, UNDER NEW EDITORS.

In Weekly Numbers, demy 8vo. printed in double columns, 6d.; or 7d. stamped for transmission by post; also in Monthly Parts, 2s. or 2s. 6d. each. *[Published every Friday Morning.]*

The subjects now in progress, or proposed to be forthwith commenced in the New Series comprise the following:—

Heller, Vogel, and Scherer's Researches in Microscopical and Chemical Pathology will be published under the superintendence of Mr. W. S. KIRKES, of St. Bartholomew's Hospital; illustrated with woodcuts.

Microscopical Researches in general, so far as they relate to the Practice of Medicine and Surgery.

A Complete Course of Lectures on Medical Jurisprudence, delivered at Guy's Hospital, by ALFRED S. TAYLOR, Member of the Royal College of Surgeons; and Lecturer on Medical Jurisprudence and Chemistry at Guy's Hospital.

A Course of Eight Lectures on the Chemistry of the Metals, in course of delivery at the Royal Institution, by Professor FARADAY, D.C.L. F.R.S. &c.

A Course of Lectures on Mental Diseases, by FRANCIS RICHARD PHILP, M.D. Cantab. Physician to St. Luke's Hospital.

Clinical Lectures on Medicine, by Dr. C. J. B. WILLIAMS, F.R.S. Physician to University College Hospital.

The Clinical Lectures on Surgery, delivered by Mr. CÆSAR HAWKINS, at St. George's Hospital.

Reports of Cases treated in the London Hosdital, with Clinical Observations, by Dr. PEREIRA, F.R.S.

Reports of Cases treated in St. Bartholomew's Hospital, with Remarks, by Dr. GEORGE BURROWS.

Mr. STANLEY's Clinical Lectures at St. Bartholomew's Hospital will be continued.

Reports of Cases treated in the London Hospital, with Clinical Observations by J. LUKE, Esq. Surgeon to the Hospital.

Clinical Observations on Cases treaed in the Westminster Hospital, by B. PHILLIPS, F.R.S.

Clinical Lectures, by SAMUEL SOLLY, F.R.S. Senior Assistant Surgeon to St. Thomas's Hospital.

Lumleian Lectures, delivered at the College of Physicians, by Sir GEO. LEFEVRE, M.D. &c.—Morbid Poisons; Scarlatina.

Clinical Reports of Cases treated in Guy's Hospital; under the Sanction of the Hospital Authorities.

Medical Observations on Egypt and the South of Europe, particularly with reference to Climate and the Cure of Diseases of the Lungs: collected during a Two-Years' Tour. By H. G. NOYES, M.B.


A Series of Papers on the Structural and Pathological Anatomy of the Vascular System. By Dr. NORMAN CHEVERS.

Practical Commentaries on the Treatment of Dyspepsia in all its Forms. By ROBERT DICK, M.D. Author of "Derangements, Primary and Reflex, of the Organs of Digestion," and "Treatise on Diet and Regimen."

Practical Commentaries on the Diagnosis and Treatment of the more important Diseases of the Skin. By JOHN ERICHSEN, Esq. Lecturer on Anatomy and Physiology at the Westminster Hospital, &c.

"This long-established medical periodical has recently come out under a new form, considerably increased in size, and diminished in price, and high as its character has ever deservedly stood, that character is now greatly improved. The nine numbers which have appeared since the alteration have contained lectures delivered by some of our most eminent professors, medical and surgical, with a great number of valuable original communications from men of the highest stand in the profession. The leading articles are ably written; the reviews learned and impartial; the selected articles evince good judgment. There have also appeared some valuable papers on Toxicological subjects, some of which are by Mr. Alfred S. Taylor, the able lecturer on Medical Jurisprudence at Guy's Hospital. The proceedings of the various medical societies are also given at some length. Altogether, it is a journal which no member of the profession, be he chemist, general practitioner, or physician, should omit to take. We consider it one of the most carefully edited medical periodicals of the day, and as such we heartily wish it success."—THE CHEMIST.

* * * Subscription to the Stamped Edition, £1. 10s. per annum, or 7s. 6d. per quarter, payable in advance.

 Orders for the Stamped Edition received by all Newsvenders.

ACTON (ELIZA).—MODERN COOKERY,

In all its Branches, reduced to a System of Easy Practice. For the use of Private Families. In a Series of Receipts, all of which have been strictly tested, and are given with the most minute exactness. By ELIZA ACTON. Dedicated to the Young Housekeepers of England. 2d Edition, improved. Fcp. 8vo. illustrated by woodcuts, 7s. 6d. cloth.

"The whole of Miss Acton's recipes, 'with a few trifling exceptions, which are scrupulously specified, are confined to such as may be perfectly depended on from having been proved beneath our own roof, and under our own personal inspection.' We add, moreover, that the recipes are all reasonable, and never in any instance extravagant. They do not bid us sacrifice ten pounds of excellent meat, that we may get a couple of quarts of gravy from it; nor do they deal with butter and eggs as if they cost nothing. Miss Acton's book is a good book in every way; there is right-mindedness in every page of it, as well as thorough knowledge and experience of the subjects she handles."—MEDICAL GAZETTE.

Medical and Surgical Works.

AINSLIE.—MATERIA INDICA:

An Account of those Articles which are employed by the Hindoos, and other Eastern Nations, in their Medicine, Arts, and Agriculture, &c. &c. By Sir WHITELAW AINSLIE, M.D. M.R.A.S. 2 vols. 8vo. £2. boards.

ALDIS (DR.)—MINUTES OF EVIDENCE GIVEN BY C. J. B.

ALDIS, M.A. M.D. Cantab. &c. Extracted from the First Report of the Commissioners for Inquiring into the State of Large Towns and Populous Districts, on the Causes of Disease and Means of Prevention. 12mo. 6d. sewed.

ALDIS (DR.)—AN INTRODUCTION TO HOSPITAL PRACTICE,

IN VARIOUS COMPLAINTS; with Remarks on their Pathology and Treatment. By C. J. B. ALDIS, M.A. M.D. Cantab. &c. 8vo. 5s. 6d. boards.

ALISON.—SOME OBSERVATIONS ON ORGANIC ALTERA-

RATIONS of the HEART; and particularly on the beneficial Employment of Iron in the Treatment of such Cases. By S. SCOTT ALISON, M.D. Member of the Royal College of Physicians, London; Physician to the Northern Dispensary, &c. &c. Fcp. 8vo. 2s. 6d. cloth.

AMESBURY.—PRACTICAL REMARKS ON THE NATURE

and TREATMENT of FRACTURES of the TRUNK and EXTREMITIES: with Plates, Woodcuts, and Cases. By JOSEPH AMESBURY. 2 vols. 8vo. 25s. boards.

ANNESLEY.—RESEARCHES INTO THE CAUSES, NATURE,

and TREATMENT of the more prevalent DISEASES of INDIA, and of WARM CLIMATES generally. By J. ANNESLEY, F.R.S. F.S.A. late President of the Medical Board, Madras. 2d Edition, 8vo. 12s. cloth.

The object of the author has been to revise, correct, and condense the former edition, so as to present to the reader a Practical Manual, founded on personal experience, of the diseases of warm climates, and more particularly of India.

A few copies of the First Edition are left. 2 thick vols. imperial 4to. with numerous splendid coloured Plates of Morbid Structures, £14. 14s. boards.

BALMAIN.—LESSONS ON CHEMISTRY,

For the use of Pupils in Schools, Junior Students in Universities, and Readers who wish to learn the fundamental Principles and leading Facts: with Questions for Examination, a Glossary of Chemical Terms and Chemical Symbols, and an Index. By WILLIAM H. BALMAIN. Fcp. 8vo. with numerous Woodcuts, illustrative of the Decompositions, 6s. cloth.

BATEMAN.—A PRACTICAL SYNOPSIS OF CUTANEOUS

DISEASES, according to the arrangement of Dr. WILLAN; exhibiting a concise View of the Diagnostic Symptoms and the Method of Treatment. By T. BATEMAN, M.D. 8th Edit. edited by Dr. A. T. THOMSON. 8vo. 15s.

BECK, T. R. & J. R.—ELEMENTS OF MEDICAL JURISPRU-

DENCE. By Dr. T. R. BECK, and Dr. J. R. BECK, of New York. 7th Edition, brought down by the authors to the present Time, with the Notes of Dr. Dunlop and Dr. Darwall, 8vo. 21s. cloth.

The present edition is reprinted from the latest (sixth) issued in America, with various MS additions communicated directly to the Publishers by the Authors.

BRANDE.—A DICTIONARY OF SCIENCE, LITERATURE, and ART; comprising the History, Description, and Scientific Principles of every Branch of Human Knowledge: with the Derivation and Definition of all the Terms in general Use. Edited by W. T. BRANDE, F.R.S.L. & E. assisted by JOSEPH CAUVIN, Esq. The various Departments are by gentlemen of eminence in each. 8vo. with wood Engravings, 60s. cloth.

BRIGHT AND ADDISON.—ELEMENTS OF THE PRACTICE of MEDICINE. By RICH. BRIGHT, M.D. F.R.S., and THOMAS ADDISON, M.D. Lecturers at Guy's Hospital. Parts 1 to 3, forming the Vol. I. 8vo. 16s. 6d. cloth.

This volume includes the whole necessary to be said on FEVER and the PHLEGMASIÆ: it may be considered as forming in itself nearly a complete work.

BRIGHT.—REPORTS OF MEDICAL CASES:

Selected with a view of illustrating the Symptoms and Cure of Diseases by a reference to Morbid Anatomy. By RICHARD BRIGHT, M.D. F.R.S. Physician Extraordinary to Her Majesty, &c. 4to.

Vol. I. Dropsy, Inflammation of the Lungs, Phthisis, and Fever, with 16 coloured Plates, £4. 4s. boards.

Vol. II. Of the Brain and Nervous System; 38 coloured Plates, £9. 9s.

BRODIE.—LECTURES ON THE DISEASES OF THE URINARY ORGANS. By Sir BENJAMIN C. BRODIE, Bart. F.R.S. Serjeant-Surgeon to the Queen. 3d Edition, with alterations and additions, 8vo. 12s. cloth.

The work has throughout been entirely revised, some of the Authors views have been modified, and a considerable proportion of new matter (among which is a Lecture on the Operation of Lithotrity) has been added.

BRODIE.—LECTURES ILLUSTRATIVE OF CERTAIN LOCAL NERVOUS AFFECTIONS. By Sir B. C. BRODIE. 8vo. 4s. boards.

BRODIE.—PATHOLOGICAL & SURGICAL OBSERVATIONS on DISEASES of the JOINTS. By Sir BENJAMIN C. BRODIE, Bart. F.R.S. Serjeant-Surgeon to Her Majesty. 4th Edition, with alterations and additions, 10s. 6d.

BULL.—HINTS TO MOTHERS,

For the MANAGEMENT of HEALTH during the period of PREGNANCY and in the LYING-IN ROOM; with an Exposure of Popular Errors in connection with those subjects. By THOMAS BULL, M.D., Physician-Accoucheur to the Finsbury Midwifery Institution, &c. &c. 4th Edition, revised and considerably enlarged. Fcp. 8vo. 7s. cloth.

BULL.—THE MATERNAL MANAGEMENT OF CHILDREN, In HEALTH and DISEASE. By T. BULL, M.D. Member of the Royal College of Physicians, Physician-Accoucheur to the Finsbury Midwifery Institution, Author of "Hints to Mothers for the Management of their Health during Pregnancy and in the Lying-in Room." 2d Edit. revised and enlarged. Fcp. 8vo. 7s. cloth.

"Excellent guides, and deserve to be generally known."

JOHNSON'S MEDICO-CHIRURGICAL REVIEW.

BURNS.—PRINCIPLES OF MIDWIFERY;

Including the Diseases of Women and Children. By JOHN BURNS, M.D. Regius Professor of Surgery, Glasgow. 10th Edition, revised and enlarged, 8vo. 16s. boards.

** The Tenth Edition has been carefully revised, in some parts re-written, and new matter added.

CARMICHAEL.—CLINICAL LECTURES ON VENEREAL DISEASES. By RICHARD CARMICHAEL, M.R.I.A. &c. &c. &c. Reported by SAMUEL GORDON, A.M. Illustrated by coloured Engravings of the different forms of Eruption. 8vo. 7s. 6d. cloth.

CHRISTISON (DR.)—A TREATISE ON POISONS,

In relation to Medical Jurisprudence, Physiology, and the Practice of Physic. By ROBERT CHRISTISON, M.D. F.R.S.E. Professor of Materia Medica in the University of Edinburgh, Fellow of the Royal College of Physicians, &c. &c. &c. 4th Edition, enlarged and improved, 8vo. 20s. cloth.

"We cannot but hail with satisfaction a new edition of this standard classical book. Its merits are too well acknowledged for it to be necessary to say anything further in its behalf. Wherever toxicology is known as a science, Professor Christison's treatise is received as an authority of the greatest weight. Dr. Christison has himself revised the present edition; and having taken advantage, he states, of the numerous investigations which have been carried on during the last eight years in the several departments of toxicology in the leading countries of Europe, he has found it necessary materially to change the size of the work. He has not, however, been obliged, he adds, in order to embody recent additions to our knowledge, to alter in any important degree, either the general principles formerly laid down in previous editions, or what he had previously stated as well ascertained general facts."—LANCET.

CHURCHILL.—OBSERVATIONS ON THE DISEASES INCIDENT TO PREGNANCY AND CHILDBED. By F. CHURCHILL, M.D. 8vo. 12s. cloth.

CHURCHILL.—ON THE PRINCIPAL DISEASES OF FEMALES. By FLEETWOOD CHURCHILL, M.D., M.R.I.A., Licentiate of the King and Queen's College of Physicians in Ireland; Lecturer on Midwifery, with Diseases on Women and Children, and Physician-Accoucheur to the Western Lying-In Hospital, and to the Adelaide Hospital, Dublin, &c. 2d Edition, fcp. 8vo. with Engravings, 8s. 6d. cloth.

CHURCHILL.—RESEARCHES ON OPERATIVE MIDWIFERY: with Plates. By F. CHURCHILL, M.D. 8vo. 14s. cloth.

CLARKE.—OBSERVATIONS ON THE DISEASES OF FEMALES. Illustrated by Plates. By Sir C. M. CLARKE, Bart. M.D. F.R.S. 3d Edition, 2 vols. royal 8vo. 36s. boards.

CONQUEST.—OUTLINES OF MIDWIFERY; Developing its Principles and Practice. Intended as a Text-Book for Students, and a Book of Reference for Junior Practitioners. By J. T. CONQUEST, M.D. F.L.S. 6th Edition, revised, Plates, 12mo. 7s. 6d. cloth.

COOPER.—A DICTIONARY OF PRACTICAL SURGERY; With all the most interesting Improvements down to the present period; an Account of the Instruments and Remedies employed in Surgery; the Etymology and Signification of the principal Terms; and numerous References to Ancient and Modern Works, forming a Catalogue of Surgical Literature, arranged according to subjects. By SAMUEL COOPER, Senior Surgeon to University College Hospital, &c. 7th Edit. revised and enlarged, 8vo. 30s. cloth.

COOPER.—THE FIRST LINES OF THE THEORY AND PRACTICE OF SURGERY; explaining and illustrating the Doctrines relative to the Principles, Practice, and Operations of Surgery. By S. COOPER. 7th Edition, corrected and augmented, 8vo. 18s. boards.

This Edition has received numerous corrections, so as to adapt it to the present state of Surgery, and to the wants of the Student and Young Practitioner. It also serves as a text-book for the Lectures annually delivered by Mr. Cooper to his Surgical Class.

COOPER, SIR A. P.—ON THE ANATOMY OF THE BREAST. By Sir A. P. COOPER, Bart. F.R.S., &c. 4to. with 27 Plates, several coloured, 63s. cloth.

COPLAND.—DICTIONARY OF PRACTICAL MEDICINE; A Library of Pathology, and a Digest of Medical Literature. Comprising—General Pathology; a Classification of Diseases according to Pathological Principles; a Bibliography, with References; an Appendix of Formulæ; a Pathological Classification of Diseases, &c. By JAMES COPLAND, M.D. F.R.S., Fellow of the Royal College of Physicians, &c. &c.

Vols. 1 and 2, 8vo. 30s. each, cloth.

Parts 1 to 9—ABDOMEN to OZÆNA.

Parts 1 to 4, 9s. each; Parts 5 to 9, 4s. 6d. each.

*** Part X. will shortly be published.—To be completed in One more Volume.

The PREFACE, with a Pathological Classification of Diseases, &c. forming a Key to the Systematic Study of Practical Medicine, as well as an arranged Table of the Contents of the Work, will accompany the last Part.

An INDEX of the Individual Topics comprised under the various Chapters and Sections of each article will also be given in the last Part.

"We feel it a great duty to record our opinion—that, as there is no medical practitioner in this country, old or young, high or low, who will not derive great pleasure and great profit by consulting Dr. Copland's Dictionary, so we think there is no one who should not add the work to his library. The information amassed in these volumes is literally enormous, and contemplated simply as an accumulation, it must excite astonishment as the production of an individual; but when it is further considered, that the whole of the materials have been most carefully selected from all existing sources, most patiently studied, valued, winnowed, digested, elaborated, and arranged into compact and simple forms, easily accessible, and readily available in practice, it is not easy to point out, in the whole range of medical literature, any work by a single hand so much calculated to excite admiration of the industry and talents of the author. On every article contained in the volumes, the reader cannot fail to be struck with the writer's most extensive learning, which has enabled him to collect knowledge from all authorities, ancient and modern, foreign and domestic; and he will, at the same time, be no less surprised than gratified at the singular power which has arranged the whole so lucidly and in such systematic order."—BRITISH AND FOREIGN MEDICAL REVIEW.

COULSON.—ON DISEASE OF THE HIP-JOINT:

With Observations on Affections of the Joints in the Puerperal State. By WILLIAM COULSON, Surgeon to the Magdalen Hospital, &c. 2d Edition, with Additions and Alterations, 8vo. Plates, 7s. boards.

COULSON.—ON THE DEFORMITIES OF THE CHEST AND SPINE. By WM. COULSON, Surgeon. With numerous Plates and Woodcuts. 2d Edition, greatly enlarged, 8vo. 6s. cloth.

COULSON.—ON DISEASES OF THE BLADDER AND THE PROSTATE GLAND. 3d Edit. much enlarged, with Plates, 8vo. 7s. cloth.

This Edition has been carefully revised in all its parts, and much valuable matter has been added to the chapters on Urine, on Stone, and on the Affections of the Prostate Gland.

CURLING.—A PRACTICAL TREATISE ON THE DISEASES of the TESTIS, and of the Spermatic Cord and Scrotum. By T. B. CURLING, Lecturer on Surgery, and Assistant-Surgeon to the London Hospital, Surgeon to the Jews' Hospital, &c. Author of "A Treatise on Tetanus." 8vo. with Illustrations by Bagg, 18s. cloth.

"The author has not only been happy in the selection of his subject, as a treatise embracing within a moderate compass all the diseases of the testis, and of the scrotum, was very much wanting, but he has executed his undertaking with praiseworthy industry and zeal, aided by a sound practical judgment. In his book he has moreover thrown much new light on the nature and treatment of the disorders of the testicle, and produced a work on those diseases, not only superior to any yet published, but which, we imagine, is not likely to be soon superseded by a better. The volume is elegantly printed, and the woodcuts, by Bagg, are beautiful."—BRITISH AND FOREIGN MEDICAL REVIEW.

DONOVAN.—A TREATISE ON CHEMISTRY.

By MICHAEL DONOVAN, M.R.I.A. 4th Edition, fcp. 8vo. Vignette Title, 6s. cloth.

ELLIOTSON.—HUMAN PHYSIOLOGY.

With which is incorporated much of the elementary part of the INSTITUTIONES PHYSIOLOGICÆ of J. F. Blumenbach, Professor in the University of Göttingen. By JOHN ELLIOTSON, M.D. Cantab. F.R.S. Fifth Edition. 8vo. with numerous Woodcuts, £2. 2s. cloth.

Separately, in Three Parts, as follows:—

PART 1, General Physiology, and the Organic Functions. 5th Edition, 10s. 6d.

" 2, The Animal Functions. 5th Edition, 14s.

" 3, Human Generation; the Growth, Decay, and Varieties of Mankind: with an Appendix on Mesmerism. 17s.

FIELD.—POSTHUMOUS EXTRACTS FROM THE VETERINARY RECORDS of the late JOHN FIELD. Edited by his Brother, WILLIAM FIELD, Veterinary Surgeon, London. 8vo. 8s. boards.

FRANKUM.—DISCOURSE ON THE ENLARGED AND PENDULOUS ABDOMEN; showing it to be a Visceral Affection, attended with important consequences in the Human Economy: with cursory Observations on Diet, Exercise, and the general Management of Health, for the use of the Dyspeptic. By RICHARD FRANKUM, Esq. Surgeon.

The Second Edition, augmented with a Dissertation on Gout, suggesting New Physiological Views as to its Cause, Prevention, and the best course of Treatment. Fcp. 8vo. 5s. cloth.

GRAHAM.—GRAEFENBERG; OR, A TRUE REPORT OF the WATER-CURE (as practised at Graefenberg): with an Account of its Antiquity. By ROBERT HAY GRAHAM, M.D. 8vo. 6s. cloth.

GRAVES.—A NEW SYSTEM OF CLINICAL MEDICINE.

By R. J. GRAVES, M.D. M.R.I.A. one of the Physicians to the Meath Hospital and County of Dublin Infirmary; formerly Professor of the Institutes of Medicine, Honorary Corresponding Member of the Royal Medical Society of Berlin, the Imperial Medical Society of Vienna, and of the Medico-Chirurgical Societies of Hamburgh, Tübingen, Bruges, Montreal, &c. &c. 8vo. 18s. cloth.

HENSLOW.—THE PRINCIPLES OF DESCRIPTIVE AND PHYSIOLOGICAL BOTANY. By J. S. HENSLOW, M.A. F.L.S. &c. 1 vol. fcp. 8vo. with Vignette Title, and nearly 70 Woodcuts, 6s. cloth.

HOLLAND.—MEDICAL NOTES AND REFLECTIONS.

By HENRY HOLLAND, M.D. F.R.S. &c., Physician Extraordinary to the Queen, and Physician in Ordinary to H.R.H. Prince Albert. 2d Edition, 8vo. 18s. cloth.

CONTENTS.—On Hereditary Disease—On Bleeding in Affections of the Brain—On the Abuse of Purgatives—On points where a Patient may judge for himself—On Gout, and the use of Colchicum—On the Epidemic Influenza—On Insanity, Intoxication, &c.—On Mercurial Medicines—On the Medical Treatment of Old Age—On Diet, and Disorders of Digestion—The Influence of Weather in relation to Disease, &c.

HOOPER.—LEXICON MEDICUM:

A MEDICAL DICTIONARY; containing an Explanation of the Terms in

Anatomy,	Materia Medica,	Physiology,
Botany,	Midwifery,	Practice of Physic,
Chemistry,	Pharmacy,	Surgery,

And the various branches of Natural Philosophy connected with Medicine: compiled from the best Authors. By the late Dr. HOOPER. 7th Edition, revised and enlarged, by KLEIN GRANT, M.D. &c. Lecturer on Therapeutics. 1 vol. 8vo. 30s. cloth.

HOOKE. — THE BRITISH FLORA;

Comprising the Flowering Plants and the Ferns. By Sir W. J. HOOKE, K.H. LL.D. 4th Edit. 8vo. with Plates, containing 82 Figures, illustrative of the Grasses and Umbelliferous Plants, 12s.; coloured, 16s. cloth.

In this edition all the newly-discovered Species are introduced. The Linnæan arrangement is followed in the body of the work; but in the Appendix are given the Characters of all the Natural Orders, with a List of the Genera, referring to the pages where they are described.

HOOKE. — COMPENDIUM OF THE ENGLISH FLORA.

2d Edition, with Additions and Corrections. By Sir W. J. HOOKE. 12mo. 7s. 6d. cloth.

THE SAME IN LATIN. 5th Edition, 12mo. 7s. 6d. boards.

HUNT. — RESEARCHES ON LIGHT:

An Examination of all the known Phenomena connected with the Chemical Influence of the Solar Rays; embracing all the published Photographic Processes, and many new Discoveries in the Art, &c. By R. HUNT, Secretary to the Royal Cornwall Polytechnic Society. 8vo. with Plate and Woodcuts, 10s. 6d. cloth.

KANE. — ELEMENTS OF CHEMISTRY;

Including the most recent Discoveries and Applications of the Science to Medicine and Pharmacy, and to the Arts. By R. KANE, M.D. M.R.S.L. 8vo. with 236 Woodcuts, 24s. cloth.

KNOWLSON. — THE YORKSHIRE CATTLE DOCTOR AND

FARRIER: a Treatise on the Diseases of Horned Cattle, Calves, and Horses, written in plain language, which those who can read may easily understand. The whole being the result of 70 years' extensive practice of the Author, JOHN C. KNOWLSON. 2d Edition, revised, corrected, and enlarged. Many of the Recipes in this book are worth 10 guineas each, and the whole are new to the world. 8vo. boards, 7s.

KRAMER. — NATURE AND TREATMENT OF THE DISEASES

of the EAR. By Dr. WILLIAM KRAMER. Translated from the German, with the latest improvements of the author since the last German edition, by J. R. BENNETT, M.D. &c. 8vo. with plates, 10s. 6d. boards.

LARDNER'S CABINET CYCLOPÆDIA;

Comprising a Series of Original Works on History, Biography, Literature, the Sciences, Arts, and Manufactures. Conducted and edited by Dr. LARDNER.

The Series, complete, in One Hundred and Thirty-three Volumes, £39. 18s.

The works, separate, 6s. per volume.

LARDNER & WALKER. — A TREATISE ON ELECTRICITY,

MAGNETISM, and METEOROLOGY. By D. LARDNER, LL.D. F.R.S., and C. V. WALKER, Secretary of the Electrical Society. 2 vols. fcp. 8vo. 12s. cloth.

LATHAM. — ON DISEASES OF THE HEART.

Lectures on Subjects connected with Clinical Medicine; comprising Diseases of the Heart. By P. M. LATHAM, M.D. Physician Extraordinary to the Queen; and late Physician to St. Bartholomew's Hospital. In Two Volumes. Vol. 1, 12mo. 8s. cloth.

"A book pointedly designed and admirably suited to popularise the study of Diseases of the Heart; and, as it is one of no ordinary merit, both as to matter and style, we have great pleasure in reviewing it, chapter by chapter, from beginning to end. As appears, indeed, from what has been stated concerning the author's own estimate of his labours, Dr. Latham's work may be looked upon as a *Cardiac Pathology made Easy*. But it is much more than this. It is a deeply reflective volume, replete with results indicative of close observation, and abounding with hints and directions which cannot fail to give a strong and beneficial impulse to the study of cardiac disease."—BRITISH AND FOREIGN MEDICAL REVIEW.

"These lectures are remarkable for their impressive and interesting manner; for the value of the information which they communicate; and for the strong practical character which they present. They should be carefully studied, and we have no doubt that they will be studied with interest and advantage."—EDINBURGH MEDICAL AND SURGICAL JOURNAL.

"The doctrines enunciated are sound and scientific; the practice inculcated most judicious; the author's style is singularly lucid and attractive; the object of his lectures, practically a most useful one, is never lost sight of, but enforced with great power. The student will be grateful for a guide so safe and judicious, offered by a teacher of such experience, high station, and distinguished ability as Dr. Latham; from whom we part with feelings of sincere respect, and with the hope of soon again meeting him in the progress of his labours."

DUBLIN MEDICAL JOURNAL.

LAYCOCK.—A TREATISE ON THE NERVOUS DISEASES OF

WOMEN; comprising an Inquiry into the Nature, Causes, and Treatment of Spinal and Hysterical Disorders. By THOMAS LAYCOCK, M.D. Member of the Royal College of Surgeons in London. 8vo. 10s. 6d. cloth.

LECTURES ON POLARISED LIGHT,

Delivered before the Pharmaceutical Society, and in the Medical School of the London Hospital. 8vo. illustrated by above 50 Woodcuts, 5s. 6d. cloth.

LEFEVRE.—AN APOLOGY FOR THE NERVES;

Or, their Importance and Influence in Health and Disease. By Sir GEORGE LEFEVRE, M.D. Fellow of the Royal College of Physicians, &c. &c. &c.; Author of "The Life of a Travelling Physician," "Thermal Comfort," &c. Post 8vo. 9s. cloth.

"Sir George Lefevre's 'Apology' is one of those at once learned, gossiping, and clever works, which the profession, and many out of it, especially those who have lived long enough to sympathise with and enjoy the author's peculiarities, will delight to peruse, without deriving from it habits of superficial examination or dogmatical dictation."—LITERARY GAZ.

LEE.—LECTURES ON THE THEORY AND PRACTICE OF

MIDWIFERY, delivered in the Theatre of St. George's Hosp. By ROBERT LEE, M.D. F.R.S. Fellow of the Royal Coll. of Physicians, Physician to the Brit. Lying-in Hosp., and Lecturer on Midwifery at St. George's Hosp. 8vo. with nearly 70 Illustrations on Wood, 15s. cloth.

"A truly practical work, containing not only the author's opinions on the different subjects connected with midwifery, but the results of his experience, founded on an accurate knowledge of medical science, great industry and perseverance, and extensive opportunities of practice in the art of delivery at the British Lying-in Hospital. It forms a most excellent book of instructions, and will be found useful for the student, and also for the general practitioner, who will obtain from it the best kind of information on the various and indeed all points of material difficulty and of less frequent occurrence."—LANCET.

"We consider that a comprehensive work of the present kind, illustrating the science of obstetricity by ample statistical tables of actual cases from the practice of a man of eminence in his profession, was imperatively required; and are very glad to have thus collected together, in one entire volume, the many valuable contributions made to this branch of medical literature by Dr. Lee, in an extensive range of observation, during a practice of many years, and which have hitherto been scattered amongst the several medical periodicals. From the clinical character of his work, and its including a vast number of illustrative cases, we think it fully as well adapted for a book of reference to the practitioner as for an elementary manual of midwifery for the student."—M'LACHLAN'S JOURNAL.

LEVER.—PRACTICAL TREATISE ON ORGANIC DISEASES

of the UTERUS: being the Prize Essay to which the Medical Society of London awarded the Fothergillian Gold Medal for 1843. By JOHN C. W. LEVER, M.D. Member of the Royal College of Physicians, London, Assistant-Accoucheur at Guy's Hospital, &c. 8vo. 9s. cloth.

"Dr. Lever is one of those physicians who have a right to address the medical public. He has not written before he has seen, but, on the contrary, he has seen before he has written. The result is a sound, practical work; not an analysis of other people's opinions, but founded on the author's own personal experience; and, as such, well deserving our serious consideration. We may safely pronounce his treatise one of the most practical and useful that have yet been published in our country; one which will undoubtedly tend to promote the study of uterine pathology."—LANCET.

LIFE (THE) OF A TRAVELLING PHYSICIAN,

From his first Introduction to Practice; comprising Twenty Years' Wanderings through the greater part of Europe: with Notes of Events, Descriptions of Scenery, and Sketches of Character. 3 vols. post 8vo. with 3 coloured Plates, £1. 11s. 6d. cloth.

"The present work is written in a lively, often facetious, style—interspersed with deep reflection and acute observation. We return our best thanks to the unknown, or at least anonymous, author for the entertainment and information we have derived from his amusing life, which we hope will be prolonged so that he may be able, twenty years hence, to give us three more volumes of professional travels through modern Babylon."

JOHNSON'S MEDICO-CHIRURGICAL REVIEW.

LINDLEY.—A SYNOPSIS OF THE BRITISH FLORA,

Arranged according to the Natural Orders; containing Vasculares, or Flowering Plants. 3d Edition, with numerous Additions, Corrections, and Improvements. By JOHN LINDLEY, Ph.D. F.R.S., &c. Fcp. 8vo. 10s. 6d. cloth.

LINDLEY.—AN INTRODUCTION TO BOTANY.

3d Edition, with Corrections and considerable Additions. By Dr. LINDLEY. 1 large vol. 8vo. with numerous Plates and Woodcuts, 18s. cloth.

The Author has followed very nearly the method recommended by De Candolle. He has adopted four great divisions, under the respective heads of Organography, Vegetable Physiology, Glossology, and Phytography. The present edition has received a great accession of new matter, especially in what relates to Vegetable Anatomy and Physiology.

LINDLEY.—FLORA MEDICA :

A Botanical Account of all the most remarkable Plants used in Medicine. By JOHN LINDLEY, Ph. D. F.R.S. L.S. &c. Professor of Botany in the London University College, &c. 8vo. 18s. cloth.

Few persons engaged in teaching Medical Botany have not experienced great inconvenience from the want of some work in which correct systematical descriptions of medicinal plants might be found, and cheap enough to be used as a class-book. The necessity that Students should have access to a botanical account of this nature became so urgent as to induce the appearance of the above volume.

LISTON.—THE ELEMENTS OF SURGERY.

By ROBERT LISTON, Surgeon to the North London Hospital. New Edition, almost entirely re-written, in one very thick volume, 8vo. with upwards of 150 Woodcuts, and Three Copperplates, 25s. cloth.

The general principles which ought to guide the practitioner in the management of constitutional disturbance are here laid down. The descriptions of particular diseases have been faithfully sketched from nature.

LITTLE.—ON ANKYLOSIS, OR STIFF-JOINT :

A Practical Treatise on the Contractions and Deformities resulting from Diseases of Joints. By W. J. LITTLE, M.D. Lecturer at, and Assistant-Physician to, the London Hospital; Physician to the Orthopædic Institution, the Infant-Orphan and the Merchant-Seaman's Orphan Asylums, &c.; Author of "a Treatise on Club-Foot." 8vo. with Illustrations on Wood, 8s. 6d. cloth.

LITTLE.—A TREATISE ON THE NATURE OF CLUB-FOOT

and ANALOGOUS DISTORTIONS; including their Treatment, both with and without Surgical Operation; illustrated by a series of Cases and numerous Practical Instructions. By W. J. LITTLE, M.D. 8vo. with Forty-one Wood Engravings, 12s. cloth.

CONTENTS: Opinions of Authors, Varieties of Club-Foot, Anatomy, Pathology, Causes, Distortions from Teething, Contractions from Paralysis and Spasm, Hysterical Distortions.

LOUDON.—ENCYCLOPÆDIA OF PLANTS;

Comprising the Description, Specific Character, Culture, History, Application in the Arts, and every other desirable particular, respecting all the Plants Indigenous to, Cultivated in, or Introduced into, Britain. Edited by J. C. LOUDON, F.L.S. H.S. &c.: the Specific Characters by Prof. LINDLEY; the Drawings by J. D. C. SOWERBY, F.L.S.; and the Engravings by R. BRANSTON. New Edition, corrected, with nearly 10,000 Engravings on Wood, and with a Supplement. 8vo. 73s. 6d. cloth.

LOW.—AN INQUIRY INTO THE NATURE OF THE SIMPLE

BODIES of CHEMISTRY. By DAVID LOW, Esq. F.R.S.E. Professor of Agriculture in the University of Edinburgh. 8vo. 6s. cloth.

MACAULAY.—DICTIONARY OF MEDICINE.

For Popular Use. By ALEX. MACAULAY, M.D. 7th Edition, 8vo. 14s. cloth.

The intention of this work is not to make a man his own physician, but to give such a plain and intelligible account of diseases and their treatment, as may convey information to the general reader.

MACKENZIE.—PRACTICAL TREATISE ON DISEASES OF

the EYE. By W. MACKENZIE, M.D. Surgeon Oculist to the Queen for Scotland, &c. 3d Edition, corrected and enlarged, with an Introduction, explanatory of a Horizontal Section of the Eye, by T. WHARTON JONES, Surgeon; and an APPENDIX on the CURE of STRABISMUS, by SURGICAL OPERATION (*which may be had separately*, 1s. sewed). 8vo. with above 100 Woodcuts, and Copperplate, 25s. cloth.

MACKENZIE.—THE PHYSIOLOGY OF VISION.

By W. MACKENZIE, M.D. &c. 8vo. 10s. 6d. cloth.

MACLEOD.—ON RHEUMATISM IN ITS VARIOUS FORMS,

and on the Affections of the Internal Organs, more especially the Heart and Brain, to which it gives rise. By R. MACLEOD, M.D., Physician to St. George's Hospital. 8vo. 7s. cloth.

"We have seldom read a work which has given us more unalloyed satisfaction. It is full of sound practical observations, conveyed in language remarkably free from technical phraseology."—TIMES.

M'CORMAC.—METHODUS MEDENDI;

Or, the Description and Treatment of the principal Diseases incident to the Human Frame. By H. M'CORMAC, M.D. Consulting Physician to the Belfast Hospital; and Professor of the Theory and Practice of Medicine in the Royal Belfast Institution. 8vo. 16s. boards.

M'CORMAC.—EXPOSITION OF THE NATURE, TREATMENT,
and PREVENTION of CONTINUED FEVER. By H. M'CORMAC, M.D. 8vo. 6s. boards

MARX AND WILLIS.—ON THE DECREASE OF DISEASE
effected by the Progress of Civilization. By C. F. H. MARX, M.D. Professor of Medicine in the University of Göttingen, &c.; and R. WILLIS, M.D. Member of the Royal College of Physicians, &c. Fcp. 8vo. 4s.

"We repeat that Dr. Willis has done good service, not only to his professional brethren, but to the community generally, by the publication of this truly interesting little volume, the value of which has been considerably enhanced by the excellent notes which he has annexed."

MEDICO-CHIRURGICAL REVIEW.

MAUNSELL.—THE DUBLIN PRACTICE OF MIDWIFERY.
By Professor MAUNSELL. 12mo. 5s. boards.

MAUNSELL & EVANSON.—PRACTICAL TREATISE ON THE
MANAGEMENT and DISEASES of CHILDREN. By H. MAUNSELL, M.D. &c. and R. T. EVANSON, M.D. 4th Edition, revised, 8vo. 12s. 6d. cloth.

MIDDLEMORE.—TREATISE ON DISEASES OF THE EYE,
And its Appendages. By R. MIDDLEMORE, M.R.C.S. of Birmingham. 2 vols. 8vo. 35s. cloth.

MOORE.—THE POWER OF THE SOUL OVER THE BODY,
Considered in relation to Health and Morals. By George Moore, M.D. Member of the Royal College of Physicians, London, &c. Post 8vo. 7s. cloth.

MORTON.—A VETERINARY TOXICOLOGICAL CHART;
Containing those Agents which are known to cause Death in the Horse: with the Symptoms, Antidotes, Action on the Tissues, and Tests. By W. J. T. MORTON, Lecturer on Veterinary Surgery, &c. 3s. 6d. sheet; 6s. case; 8s. 6d. rollers.

MORTON.—A MANUAL OF PHARMACY FOR THE STUDENT
of VETERINARY MEDICINE; Containing the Substances employed at the Royal Veterinary Coll., with an Attempt at their Classification, &c. By Mr. MORTON. 3d Edit. 12mo. 10s. cloth.

NELIGAN.—MEDICINES,
Their Uses and Mode of Administration; including a Complete Conspectus of the Three British Pharmacopœias, an Account of all the New Remedies, and an Appendix of Formulæ. By J. MOORE NELIGAN, M.D.; Physician to the Jervis Street Hospital, Dublin; and Lecturer on Materia Medica and Therapeutics in the Dublin School of Medicine. 8vo. 12s. 6d. cloth.

"Dr. Neligan is fully competent to write ably on any medical subject to which he directs his attention; and is evidently a man of highly cultivated mind, of liberal and most enlightened views, and withal a sound practical physician. His work on medicines is a very valuable and accurate compilation."—MEDICO-CHIRURGICAL REVIEW.

OWEN.—LECTURES ON THE COMPARATIVE ANATOMY
and PHYSIOLOGY of the INVERTEBRATE ANIMALS, delivered at the Royal College of Surgeons in 1843. By RICHARD OWEN, F.R.S. Hunterian Professor to the College. From Notes taken by WILLIAM WHITE COOPER, M.R.C.S. and revised by Professor OWEN. With Glossary and Index. 8vo. with nearly 140 Illustrations on Wood, 14s. cloth.

*** A SECOND and concluding Volume of the above, being the Lectures delivered during the present session, is preparing (by Prof. Owen) for the press.

"By all who know the importance of Professor Owen's labours in the vast field of comparative anatomy, this work will be hailed with delight. It treats only of the anatomy of *invertebrata*. Although delivered to medical men, the lectures contain a vast amount of matter interesting to all who wish to know something of the wonderful laws which govern the structure and functions of animated beings. We can also recommend them as being admirable examples of the application of the principles of inductive science to the study of organised matter."—Dr. Lindley in THE GARDENER'S CHRONICLE.

PERCIVALL.—THE ANATOMY OF THE HORSE;
Embracing the Structure of the Foot. By WILLIAM PERCIVALL, M.R.C.S. Veterinary Surgeon 1st Life Guards. 8vo. 20s. cloth.

In this volume the Veterinary Lectures of the Author have been freely referred to; but the old matter has undergone much revision and emendation, and has been altogether fresh cast, and arranged in a systematic form.

PERCIVALL.—HIPPOPATHOLOGY.

A Systematic Treatise on the Disorders and Lamenesses of the Horse, with their most approved methods of Cure. 8vo. Woodcuts, Vol. I. 10s. 6d.; Vols. II. and III. 14s. each, bds.

This work consists of 3 Volumes, which, though connected as a whole, may be consulted as distinct treatises. Vol. I. External Diseases; Vol. II. Internal; Vol. III. Lameness.

PEREIRA.—ELEMENTS OF MATERIA MEDICA AND THE-

RAPEUTICS; comprehending the Natural History, Preparation, Properties, Composition, Effects, and Uses of Medicines. By JON. PEREIRA, M.D. F.R.S. Assistant Physician to the London Hospital, &c. Part I. contains the GENERAL ACTION AND CLASSIFICATION OF MEDICINES, and the MINERAL Materia Medica. Part II.—The VEGETABLE and ANIMAL Kingdoms, with a vast number of Woodcuts, including Diagrams explanatory of the Processes of the Pharmacopœias, a Tabular View of the History of the Materia Medica, from the earliest times to the present day, and a very copious INDEX. 2d Edition, thoroughly revised, with the Introduction of the Processes of the New Edinburgh Pharmacopœia, and containing additional articles on Mental Remedies, Light, Heat, Cold, Electricity, Magnetism, Exercise, Dietetics, and Climate, with about a Hundred Additional Woodcuts illustrative of Pharmaceutical Operations, Crystallography, Shape and Organization of the Feculas of Commerce, and the Natural History of the Materia Medica. 2 vols. 8vo. with nearly 400 Woodcuts, £2. 10s. cloth.

PEREIRA.—A TREATISE ON FOOD AND DIET,

With Observations on the Dietetical Regimen suited for Disordered States of the Digestive Organs: and an Account of the Dietaries of some of the principal Metropolitan and other Establishments, for Paupers, Lunatics, Criminals, Children, the Sick, &c. By JON. PEREIRA, M.D. F.R.S. & L.S. &c.; Author of "Elements of Materia Medica." 8vo. 16s. cloth.

"The work of Dr. Pereira is not only an excellent text-book to be placed in the hands of students, but one absolutely necessary for the use of every practitioner at the present moment, whether he has kept pace or not with organic chemistry in its recent rapid progression; it is calculated, by enabling the regular practitioner to found his directions for diet on a scientific basis, to prevent the abuse of the public mind by the empirical and frequently pernicious or ridiculous precepts of homœopathsists, hydropathists, and charlatans."

BRIT. AND FOR. MED. REVIEW.

"The department of the work which describes the twelve alimentary principles, viz. water, mucilage, saccharine matter, starch, lignine, pectine, acid, alcohol, oil, proteine, gelatine, and salt, is worthy of attentive study. We may also call especial attention to the section in which, in discussing the uses of the alcoholic principle, some views that are entertained and propagated by the advocates of teetotalism are combated. The chapter on compound aliments is full of useful matter, and has evidently been elaborated with the same minute care that we have noticed as the peculiarity of Dr. Pereira's style."—LANCET.

"We cordially recommend Dr. Pereira's valuable book to the notice of our readers. It contains a mass of useful matter—scientific, practical, and interesting,—so methodically digested and arranged as to be instantly available; and containing, as it does, all the recent results obtained by organic analysis, verified and reduced to practice, it is indispensable to the medical profession."—DUBLIN MEDICAL PRESS.

PHILIP.—A TREATISE ON PROTRACTED INDIGESTION

and its Consequences; being the application to the Practical Department of Medicine of the Results of an Inquiry into the Laws of the Vital Functions: addressed by the Author, on the retirement from the Medical Profession, both to the Members of that Profession and to his well-educated Public, particularly Parents. By A. P. W. PHILIP, M.D. F.R.S.L. and E. Fellow of the Royal Colleges of Physicians of London and Edinburgh, &c. 8vo. 10s. 6d. cloth.

PHILIP.—A TREATISE ON THE NATURE AND CURE OF

THOSE DISEASES, either Acute or Chronic, which precede Change of Structure: with a View to the Preservation of Health, and particularly the Prevention of Organic Diseases. By A. P. WILSON PHILIP, M.D. F.R.S. L. & E. 8vo. 12s. boards.

RAMADGE.—CONSUMPTION CURABLE,

And the Manner in which Nature and Remedial Art operate in effecting a Healing Process in Cases of Consumption: illustrated by Cases; with a Mode of Treatment. By DR. RAMADGE. 3d Edition, 8vo. coloured Plates, 8s. boards.

REES.—A TREATISE ON THE ANALYSIS OF THE BLOOD

and URINE, in Health and Disease; with Directions for the Analysis of the Urinary Calculi. By G. O. REES, M.D. F.R.S. Physician to the Pentonville Prison, and Assistant-Physician to Guy's Hospital. 8vo. 5s. 6d. boards.

"Calculated, by its perspicuity, simplicity, and accuracy, greatly to facilitate an acquaintance with the more important practical parts of animal chemistry."—MEDICAL GAZETTE.

REES.—THE ANALYSIS OF INORGANIC BODIES.

From J. J. BERZELIUS. By G. O. REES, M.D. 12mo. 5s. boards.

REECE.—THE MEDICAL GUIDE,

For the use of the Clergy, Heads of Families, Seminaries, and Junior Practitioners in Medicine; comprising a complete Modern Dispensatory and a Practical Treatise on the Distinguishing Symptoms, Causes, Prevention, Cure, and Palliation, of the Diseases incident to the Human Frame. By R. REECE, M.D. late Fellow of the Royal College of Surgeons of London, &c. 16th Edition, 8vo. 12s. boards.

REID (DR.)—ILLUSTRATIONS OF THE PRINCIPLES AND

PRACTICE of WARMING and VENTILATING, with Preliminary Remarks on Health and Length of Life. By D. B. REID, M.D. F.R.S.E. 8vo. With Diagrams, and 320 Engravings on wood, 16s.

“Dr. Reid has in this treatise most elaborately investigated the theory and practice of ventilation in all its bearings, and accumulated such a mass of information as to render it by far the most interesting and valuable work on the subject that has yet been published. We most cordially recommend it to our readers. They will derive both knowledge and entertainment from it; and, moreover, will learn how to protect themselves and their patients from one of the most powerful and most insidious causes of disease.”—LANCET.

RICHERAND.—ELEMENTS OF PHYSIOLOGY.

By A. RICHERAND. 5th Edition. Translated from the latest French Edition, and supplied with Notes and an Appendix, by Dr. COPLAND. 2d Edition, 8vo. 18s. boards.

RICORD.—A PRACTICAL TREATISE ON VENEREAL DIS-

EASES; or, Critical and Experimental Researches on Inoculation, applied to the study of these Affections, with a Therapeutical Summary and Special Formulary. By PH. RICORD, M.D. Surgeon of the Venereal Hospital of Paris, Clinical Professor of Special Pathology, &c. &c. Translated from the French, by HENRY PILKINGTON DRUMMOND, M.D. 8vo. 12s. cloth.

SANDBY (REV. G.)—MESMERISM AND ITS OPPONENTS ;

With a Narrative of Cases. By the Rev. GEORGE SANDBY, Jun. Vicar of Flixton, and Rector of All Saints with St. Nicholas, South Elmham, Suffolk; Domestic Chaplain to the Right Hon. the Earl of Abergavenny. Fcp. 8vo. 6s. cloth.

“The reader will find in Mr. Sandby’s remarkable little volume a large mass of curious and important facts collected, both as regards the truth of mesmerism and its curative power in disease; facts that we hold it is impossible openly to deny, or insidiously to explain away, and which, therefore, form a strong and unbroken body of evidence.”

GENTLEMAN’S MAGAZINE.

SEYMOUR.—ILLUSTRATIONS OF SOME OF THE PRINCI-

PAL DISEASES of the OVARIA, their Treatment, &c. By E. J. SEYMOUR, M.D. 8vo. with a folio Atlas of 14 Engravings, 21s. boards; India paper, 31s. 6d.

SEYMOUR.—NATURE AND TREATMENT OF DROPSY,

Considered especially in reference to the Diseases of the Internal Organs of the Body which most commonly produce it. Parts 1 and 2—Anasarca and Ascites. With an Appendix, and a Translation of the Italian Work of Dr. Geromini on Dropsy. By EDWARD J. SEYMOUR, M.D. Physician to St. George’s Hospital. 6s. boards.

SEYMOUR.—OBSERVATIONS ON THE MEDICAL TREAT-

MENT of INSANITY. By Dr. SEYMOUR. 8vo. 5s. boards.

SHEPPARD.—OBSERVATIONS ON THE PROXIMATE CAUSE

of INSANITY. By J. SHEPPARD. 12mo. 3s. 6d. cloth.

SKEY.—NEW MODE OF TREATMENT EMPLOYED IN THE

CURE of various forms of ULCERS and GRANULATING WOUNDS. By FREDERIC C. SKEY, F.R.S. Assistant-Surgeon to St. Bartholomew’s Hospital, &c. 8vo. 5s. cloth.

SKEY.—OBSERVATIONS ON A NEW OPERATION FOR

LATERAL CURVATURE of the SPINE: in which an attempt is made to discriminate the class of Cases in which alone it is applicable, as a means of Cure. By FREDERIC C. SKEY, F.R.S. Assistant Surgeon to St. Bartholomew’s Hospital, &c. 2d Edition, 8vo. 2s. 6d. sewed.

SMITH.—ON HYDROCEPHALUS.

On the Nature, Causes, Prevention, and Treatment of Acute Hydrocephalus, or Water-Brain-Fever. By THOMAS SMITH, A.M. M.D. Senior Physician to the Leeds Public Dispensary; Licentiate of the Royal College of Physicians; Member of the Royal College of Surgeons, London; Graduate in Medicine, and Master in Surgery, of the University of Glasgow, &c. Post 8vo. with Plates, 5s. 6d. cloth.

SMITH.—AN INTRODUCTION TO THE STUDY OF BOTANY.

By Sir J. E. SMITH, late President of the Linnæan Society. 7th Edition, corrected, in which the object of Smith’s “Grammar of Botany” is combined with that of the “Introduction.” By Sir W. J. HOOKER, K.H. LL.D. &c. 8vo. with 36 Steel Plates, 16s.; with coloured plates, £2. 12s. 6d. cloth.

SMITH.—THE ENGLISH FLORA.

By Sir J. E. SMITH, M.D. F.R.S. late President of the Linnæan Society. 6 vols. 8vo. £3. 12s. boards.

SMITH.—SYSTEMATIC TREATISE ON FEVER.

By SOUTHWOOD SMITH, M.D. Physician to the London Fever Hospital. 8vo. 14s. boards.

Wholly of a practical nature: its object is to ascertain the real phenomena, and the best treatment, of Fever.

SPOONER.—A TREATISE ON THE STRUCTURE, FUNCTIONS,

and DISEASES of the FOOT and LEG of the HORSE; comprehending the Comparative Anatomy of these parts in other Animals, embracing the subject of Shoeing and the proper Treatment of the Foot; with the Rationale and Effects of various Important Operations, and the best Methods of performing them. By W. C. SPOONER, M.R.V.C. 12mo. 7s. 6d. cloth.

STAFFORD.—TWO ESSAYS ON THE DISEASES OF THE

SPINE. 1. On Angular Curvature of the Spine, and its Treatment. 2. On the Treatment of Lateral Curvature by Gravitation, Lateral Exercise, &c. By R. A. STAFFORD, F.R.C.S.E. Surgeon Extraordinary to H.R.H. the Duke of Cambridge, Senior Surgeon to the St. Marylebone Infirmary, &c. &c. 8vo. 5s. cloth.

SWAN.—NEW METHOD OF MAKING DRIED ANATOMICAL

PREPARATIONS. By JOSEPH SWAN. 3d Edition, 8vo. much enlarged, 5s. boards.

SWAN.—ILLUSTRATIONS OF THE COMPARATIVE

ANATOMY of the NERVOUS SYSTEM. By JOSEPH SWAN. In 4to. £2. 12s. 6d. cloth.

SWAN.—DEMONSTRATION OF THE NERVES OF THE

HUMAN BODY. By J. SWAN. Imp. folio, with 50 Engravings, half-bound russia, £14.

The whole of the foregoing work, on a reduced scale, on 25 Steel Plates, by FINDEN. Demy 4to. 31s. 6d. cloth.

SWAN.—TREATISE ON DISEASES AND INJURIES OF THE

NERVES. By J. SWAN. 8vo. with Plates, 14s. boards.

THOMSON.—ATLAS OF DELINEATIONS OF CUTANEOUS

ERUPTIONS; illustrative of the Descriptions in Dr. Bateman's Synopsis of Cutaneous Diseases. By A. TODD THOMSON, M.D. &c. Royal 8vo. with 128 graphic Illustrations, carefully coloured on 29 Plates, £3. 3s. boards.

THOMSON.—CONSPECTUS OF THE PHARMACOPŒIAS.

15th Edition, thoroughly revised and greatly improved, containing the alterations and additions of the last London Pharmacopœia and the New French and American Remedies. By Dr. A. T. THOMSON. 18mo. 5s. 6d. cloth; roan tuck, as a pocket-book, gilt, 6s. 6d.

In this manual is compressed the most useful part of the information which is obtained from larger works; and by affording a facility of re-examination, keeps in view remedies not constantly nor generally employed.

THOMSON.—ELEMENTS OF MATERIA MEDICA AND

THERAPEUTICS; including the Recent discoveries and Analysis of Medicines. By Dr. ANTHONY TODD THOMSON, F.L.S. &c. &c. 3d Edition, enlarged and improved. 1 very thick vol. 8vo. with upwards of 100 Wood Engravings, now first inserted, £1. 11s. 6d. cloth.

The author has collected, in one point of view, all the discoveries with which modern chemistry has enriched Materia Medica, and those practical facts which clinical medicine has furnished, for elucidating the doctrine of Therapeutics. He has availed himself of the labours of Continental chemists and medical writers, as well as those of our own country and America. He has endeavoured to trace the nature and phenomena of Morbid action, and to ascertain the influence exerted by Remedial agents in removing it.

THOMSON.—THE LONDON DISPENSATORY;

Containing Translations of the Pharmacopœias of London, Edinburgh, and Dublin; the Elements of Pharmacy; the Botanical Description, Natural History, and Analysis of the Substances of the Materia Medica, &c. &c.: with a copious Index of Synonyms. Forming a Practical Synopsis of Materia Medica, Pharmacy, and Therapeutics: with Tables and Woodcuts. By ANTHONY TODD THOMSON, M.D. F.L.S. Fellow of the Royal College of Physicians, Professor of Materia Medica, &c. in University College, London. 10th Edition, corrected throughout, and materially improved, 8vo. 21s.

THOMSON.—THE DOMESTIC MANAGEMENT OF THE SICK

ROOM, necessary, in Aid of Medical Treatment, for the Cure of Diseases. By A. TODD THOMSON, M.D. F.L.S. &c. 2d Edition. Post 8vo. 10s. 6d. cloth.

“There is no interference with the duties of the medical attendant, but sound, sensible, and clear advice what to do, and how to act, so as to meet unforeseen emergencies, and co-operate with professional skill.”—*LITERARY GAZETTE*.

THOMSON (T.)—CHEMISTRY OF ANIMAL BODIES.

By THOMAS THOMSON, M.D. Regius Professor of Chemistry in the University of Glasgow, &c. &c. &c. 8vo. 16s. cloth.

TRANSACTIONS OF THE ROYAL MEDICAL AND CHIRURGICAL SOCIETY OF LONDON;

comprising many valuable and important Papers on Medicine and Surgery. Vol. IX. of the New Series, 8vo. with 9 Engravings (3 coloured), 16s. bds.

TRAVERS.—INQUIRY INTO THE PROCESS OF NATURE

in repairing INJURIES of the INTESTINES, illustrating the Treatment of Penetrating Wounds and Strangulated Hernia. By Mr. TRAVERS. 8vo. with Plates, 15s. boards.

TRAVERS.—OBSERVATIONS ON THE PATHOLOGY OF

VENEREAL AFFECTIONS. By BENJAMIN TRAVERS, F.R.S. Surgeon Extraordinary to Her Majesty. 8vo. 3s. boards.

TRAVERS.—INQUIRY CONCERNING THAT DISTURBED

STATE of the VITAL FUNCTIONS, usually denominated Constitutional Irritation. By B. TRAVERS, F.R.S. Surg.-Extraordinary to Her Majesty. 2d Edition, revised, 8vo. 14s. boards.

TRAVERS.—A FURTHER INQUIRY CONCERNING CON-

STITUTIONAL IRRITATION. and the Pathology of the Nervous System. By B. TRAVERS, F.R.S. &c. 8vo. 14s. boards.

TURNER.—A TREATISE ON THE FOOT OF THE HORSE.

And a New System of Shoeing, by one-sided nailing; and on the Nature, Origin, and Symptoms of the Navicular Joint Lameness, with Preventive and Curative Treatment. By J. TURNER, M.R.V.C. Royal 8vo. 7s. 6d. boards.

URE.—DICTIONARY OF ARTS, MANUFACTURES, & MINES;

Containing a clear Exposition of their Principles and Practice. By ANDREW URE, M.D. F.R.S. M.G.S. M.A.S. Lond.; M. Acad. N.L. Philad.; S. Ph. Soc. N. Germ. Hanov.; Mulii. &c. &c. 3d Edition, corrected, 8vo. illustrated with 1240 Engravings on Wood, 50s. cloth.

URE.—RECENT IMPROVEMENTS IN ARTS, MANUFACTURES, and MINES;

being the 2d Edition of a Supplement to the 3d Edition of his Dictionary. By ANDREW URE, M.D. F.R.S. &c. 8vo. with numerous Wood Engravings, 14s. cloth.

WAGNER.—ELEMENTS OF COMPARATIVE ANATOMY,

Designed especially for the use of Students. By RUDOLPH WAGNER, M.D. Professor of Comparative Anatomy and Physiology in the University of Göttingen, &c. Edited, from the German, by ALFRED TULK, M.R.C.S. 8vo. 9s. cloth.

“In his selection of Dr. Wagner’s manual for translation, Mr. Tulk has evinced much judgment; and for the manner in which he has edited it, he deserves great credit. We strongly recommend it to the profession as a work which should be in the possession of every one who wishes either to keep up his knowledge, or to enter upon the study of the comparative anatomy of the vertebrate animals: and we sincerely trust that the encouragement which it may receive, will enable Mr. Tulk, at no distant period, to give the promised atlas of illustrative plates.”—*DUBLIN MEDICAL JOURNAL*.

“Professor Wagner’s works are no less remarkable for perspicuity of arrangement than for practical import. The one before us, which reflects great credit upon Mr. Tulk’s editorial qualifications, evinces a thorough knowledge of the subject. As an elementary treatise, it cannot fail to supersede the now obsolete manual of the author’s predecessor. In short, after careful perusal, we have no hesitation in recommending it to every student of anatomy desirous of gaining information regarding a collateral department which has served to clear up many of the doubtful and uncertain points in physiological science.”—*MEDICAL GAZETTE*.

WALKER.—THE OCULIST’S VADE-MECUM:

A complete Practical System of Ophthalmic Surgery; with numerous Woodcuts and coloured Engravings of the Diseases and Operations on the Eye. By J. WALKER. 12mo. 10s. 6d. cloth.

WALKER.—A PRACTICAL CHART OF DISEASES OF THE SKIN; giving a succinct Description of these affections : their Diagnosis and Treatment. By G. A. WALKER, Surgeon, Author of "Gatherings from Grave Yards," "The Grave Yards of London," "Interment and Disinterment," &c. &c. 8vo. as a book, 3s. cloth; mounted on rollers, 3s. 6d.; varnished, 4s. 6d.; on a sheet of drawing-paper, 1s. 6d.

WALNE.—CASES OF DROPSICAL OVARIA REMOVED BY the large Abdominal Section. By D. HENRY WALNE, Surgeon. 8vo 3s. 6d. cloth.

"These cases were well chosen, the arrangements admirably made, the operation was well performed, and the after-treatment most judicious: we have, therefore, to praise the judgment, boldness, dexterity, and professional skill of Mr. Walne."

DUBLIN JOURNAL OF MEDICAL SCIENCE.

"To those who have analogous cases under their care, the facts recorded by Mr. Walne are highly valuable."—MEDICAL TIMES.

WEST.—A TREATISE ON PYROSIS IDIOPATHICA;

Or, Water-Brash, as contrasted with certain forms of Indigestion and of Organic Lesions of the Abdominal Organs; together with the Remedies, Dietetic and Medicinal. By THOMAS WEST, M.D. M.R.C.P. and S. &c. 8vo. 5s. cloth.

WHITE.—A COMPENDIUM OF THE VETERINARY ART;

Containing plain and concise Observations on the Construction and Management of the Stable; a brief and popular Outline of the Structure and Economy of the Horse; the Nature, Symptoms, and Treatment of the Diseases and Accidents to which the Horse is liable; the Best Methods of performing various Important Operations; with Advice to the Purchasers of Horses; and a copious Materia Medica and Pharmacopœia. By JAMES WHITE, late Vet. Surg. 1st Dragoons. 17th Edition, entirely reconstructed, with considerable Additions and Alterations, bringing the work up to the present State of Veterinary Science, by W. C. SPOONER, Vet. Surgeon, &c. &c. 8vo. with coloured Plate, 16s. cloth.

WIGAN (DR. A. L.)—THE DUALITY OF THE MIND,

Proved by the Structure, Functions, and Diseases of the Brain, and by the Phenomena of Mental Derangement; and shown to be essential to Moral Responsibility. With an Appendix: —1. On the Influence of Religion on Insanity; 2. Conjectures on the Nature of the Mental Operations; 3. On the Management of Lunatic Asylums. By A. L. WIGAN, M.D. 8vo. 12s. cl.

WHITE. — A COMPENDIUM OF CATTLE MEDICINE;

Or, Practical Observations on the Disorders of Cattle and the other Domestic Animals, except the Horse. By the late J. WHITE. 6th Edition, re-arranged, with copious Additions and Notes, by W. C. SPOONER, Vet. Surgeon, Author of a "Treatise on the Influenza," and a "Treatise on the Foot and Leg of the Horse," &c. 8vo. 9s. cloth.

WILLIS.—A TREATISE ON MENTAL DERANGEMENT;

With Cases setting forth the necessity of Restraint in the Cure and Management of the Insane. By FRANCIS WILLIS, Esq. of Shillingthorpe House, near Greatford, Stamford, M.D. 2d Edition, revised. Post 8vo. 5s. cloth.

WILSON.—PRACTICAL AND SURGICAL ANATOMY.

By W. J. ERASMUS WILSON, F.R.S. Teacher of Practical and Surgical Anatomy and Physiology. 1 vol. 12mo. with 50 Engravings on Wood by Bagg, 10s. 6d. cloth.

"It remains only to add, that, after a careful examination, we have no hesitation in recommending this work to the notice of those for whom it has been expressly written, the students, as a guide possessing very superior claims, well calculated to facilitate their studies, and render their labour less irksome, by constantly keeping before them definite objects of interest."—LANCET.

THE VETERINARIAN:

A Monthly Journal of Veterinary Science.

Edited by MESSRS. PERCIVALL and YOUATT, assisted by Professor DICK and Mr. KARKEEK. 8vo. 1s. 6d.

. A New Series commenced on the 1st of January, 1842.

THE VETERINARY RECORD,

And Transactions of the Veterinary Medical Association.

EDITED BY

MESSRS. SPOONER, SIMONDS, AND MORTON.

Published QUARTERLY—in January, April, July, and October.

8vo. 2s. 6d.

